



Science

Teachers' Training Module

For Elementary School Teachers (Grade 6-7-8)



Quaid-e-Azam Academy for Educational Development (QAED), Punjab

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This module is developed under Transformation in Access, Learning, Equity and Education Management (TALEEM) programme implemented through the financial and technical support of Global Partnership in Education (GPE) and UNICEF. The training module is prepared for the professional development of teachers from middle schools established by School Education Department (SED) under Afternoon School Programme (ASP). QAED will also use these modules for the professional development of all middle school teachers in the province.

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TABLE OF CONTENT

ABBREVIATIONS	4
PREFACE	5
Introduction to the Modules.....	6
Session Plan 1: Human Nervous System	8
Session Plan 2: Digestive System	19
Session Plan 3: Human Respiratory and Circulatory Systems.....	28
Session Plan 4: Solar System	40
Session Plan 5: Biotechnology	47
Session Plan 6: Cellular Organization.....	57
Session Plan 7: Balanced Diet	68
Session Plan 8: Application of Technology.....	75



ABBREVIATIONS

ASP	Afternoon School Programme
AEOs	Assistant Education officers
DEOs	District Education officers
Dy. DEOs	Deputy District Education officers
ESPIG	Education Sector Programme Implementation Grant
ESTs	Elementary School Teachers
GPE	Global Partnership for Education
LTs	Lead Trainers
MTs	Master Trainers
OOSC	Out of School Children
PCK	Pedagogical Content Knowledge
PEC	Punjab Examination Commission
PEIMA	Punjab Education Initiative Management Authority
PMIU	Programme Monitoring and Implementation Unit
QAED	Quaid-e-Azam Academy for Educational Development
SED	School Education Department
SLOs	Student learning outcomes
SNC	Single National Curriculum
SS	Subject Specialist
SSS	Sr. Subject Specialist
TNA	Training Need Assessment
TALEEM	Transformation in Access, Learning, Equity and Education Management
TA	Technical Assistance
UNICEF	United Nations Children Fund

PREFACE

Quaid-e-Azam Academy for Educational Development (QAED) is rendering its meritorious services in the field of teacher training from almost last 60 years. Since its inception, it is positively contributing to the professional development of teachers to achieve the quality of education in the province. The mandate of QAED is to conduct induction, continuous professional development, in-service, and promotion linked mandatory training of teachers and education managers. QAED also facilitate other departments and provinces in their training needs. This include Higher Education, Divisional Public School Lahore, Thal Public School, Punjab Daanish Schools, Punjab Education Initiative Management Authority (PEIMA), Staff of schools run under Mines and Mineral Department, and Education Department of AJK and GB.

The province of Punjab is facing serious challenges with respect to supply side of education particularly at the middle school level. The fewer middle schools result in higher post primary dropouts and increased number of OOSC in the age group of 10-14 years old. To address this challenge, SED has launched a new cost-efficient and innovative approach of afternoon schools in remote areas. The evidence, from the Afternoon School Programme (ASP), validates the approach and attest the enrolment gains especially for girls.

Considering the need for post primary education, the priorities of the Education Sector Plan (ESP), SED in collaboration of Global Partnership in Education (GPE) and UNICEF has established 1000 afternoon schools in 14 districts of Punjab through Transformation in Access, Learning, Equity and Education Management (TALEEM) Programme. These 14 districts are selected because there is huge disparity between primary and middle schools, not a single ASP school available in these districts and share similar socio-economic status, urban centers with underdeveloped rural and remote areas, and mainly concentrated in the northern areas of the province.

The primary school teachers of morning classes teach the students of elementary classes in the second shift. These teachers need support in content and pedagogical skills. QAED has developed training modules primarily based on the content of middle level grade 6-8 identified by the teachers from Afternoon School Programme through Training Need Assessment (TNA) as difficult to teach. The training modules covers the difficult areas of Science, English and Mathematics. QAED has designed training modules using Pedagogical Content Knowledge (PCK) approach in a way that it would not only strengthen their content knowledge but will also polish their pedagogical skills to teach these contents.

These training modules developed will not only benefit 1000 middle school teachers in 14 districts, but it will be rollout for all the ASP teachers and other regular middle school teachers in the province, thereby leading to increased learning levels of the children.

QAED acknowledges and appreciates the commendable inputs of all the developers, reviewers and material development team of QAED in development of this training module. QAED also acknowledge the GPE and UNICEF team in providing technical support in finalizing the training modules and also training of teachers. I sincerely believe that this manual will provide necessary skills and knowledge to the teaches which will help to improve the learning outcomes of the children.

Sarah Rashid
Director General QAED



Introduction to the Modules

The Afternoon School Program aims to provide equitable educational opportunities to children in areas where access to schools remains a challenge along with low retention and high drop-out rates. The program is designed to 'upgrade' the existing primary or middle schools to middle or high school level respectively, thereby allowing the students to transition into higher grades within the same premises and existing infrastructure. This provides easy access to the students and results in an increase in retention.

Keeping in mind the intensive need of the programme as well as to improve the quality of teaching and learning in ASP a comprehensive subject-based training modules have been designed for teachers to enhance their content knowledge on difficult SLOs. This six-days subject based training course, 2 days for each subject, is planned to be delivered through face to face training. In addition, lesson plans are also prepared for further understanding of the teachers which are part of the training material.

This training modules have been specially designed to provide with all the tools and materials necessary to effectively train master trainers and middle school teachers. It consists of two main parts: first part consists of SLOs based training session plans including teaching and learning activities and assessments for learning; and second part lesson plans for the same subjects are provided for further clarity and understanding.

Instructions for Trainers

Following are some of the instructions for trainers:

1. Read each session plan carefully before delivering the training, review all the Handouts, Worksheets, and Video resources according to the designed activities.
2. Practice the session plans and prepare all the required materials/handouts / charts.
3. Ensure the availability of all the required teaching and learning material like whiteboard/ blackboard, marker, charts and required material of the activities mentioned.
4. Ask trainee teachers to bring Textbooks of Mathematics, Science and English from grade 6 to 8 to be used during the training course.
5. Make sure seating arrangement of the training room is made according to the session plans and supportive for adults teaching.
6. Reach the venue at least 30 minutes before the start of the session.

It is hoped that this manual will be helpful and useful for the trainers and trainee teachers.

Wish you good luck



General Science

Grade – 8 Session Plan 1: Human Nervous System ⌚ Time: 90 Minutes

STUDENT LEARNING OUTCOMES


At the end of this session, the participants will be able to:

1. explain how the brain works as the control station of the human body
2. describe the structure of the cerebrum, its division into two hemispheres (left and right), and the role of each hemisphere in the control of the body
3. map the various steps in the transmission of messages through the body and to the brain via a reflex arc
4. explain and represent how messages flow through the body from and to the brain, and how the brain collaborates with the sensory organs to regulate this process
5. predict what would happen if a nerve connection breaks

MATERIALS


- Writing Board
- Marker / Chalk
- Textbook General Science Grade 8
- 8-10 walnuts if possible/slide of walnut picture vs brain
- Some readily available edible things(candy, chocolate ,sliced onion, peeled garlic, ginger, apple, lemon slice etc.) hide them in a box/Plastic container, arranged well before time)
- A spoon or fork
- A hand kerchie/scarf
- Model / Poster of the Human Brain
- Flashcards
- A4 paper sheets, chart paper sheets, Sticky Notes/ colored paper sheets, stapler
- Multimedia
- Worksheet
- Small basket for strips of paper

Opening

 05 minutes

1. Start the session with the name of Allah Almighty and ask one of the participants to recite a few verses from the Holy Quran.
2. After the recitation, welcome and greet all participants with good wishes for the best outcomes of the training.
3. After the greetings, ask the participants about;
 - Their expectations about the session.
 - What they know about the Nervous System.
 - What they want to learn about it.
4. While listening to their expectations show them on PPT or a chart containing the list of SLOS.
5. Readout all the SLOs of the session and switch to the topic by starting a new discussion.

Activity 1:


 15 minutes

1. Start the session with this interesting game
2. Touch and tell then Taste and tell
 - Put your box with edibles on table.(anything easily available, some suggestions given in material box)
 - Call a participant.
 - Tie his eyes with a handkerchief.
 - Take out any one thing from the box with the help of spoon or fork.
 - Ask him to Touch, feel and guess what is it
 - Then ask him to eat the same and tell again what it is.
 - Repeat the activity with 6-8 participants.
3. Now ask the whole class that how these participants were able to tell the right answer without seeing, what they were eating?
4. Which part of body helped them to answer?
5. Is there any control room in our body?
6. They all might say yes, second them and conclude the statement that

Note: If edibles cannot be arranged then activity can be limited to touch & tell only with easily available materials e.g. stones, pebbles, sand, eraser, duster etc.

Brain works as the control room for our body.

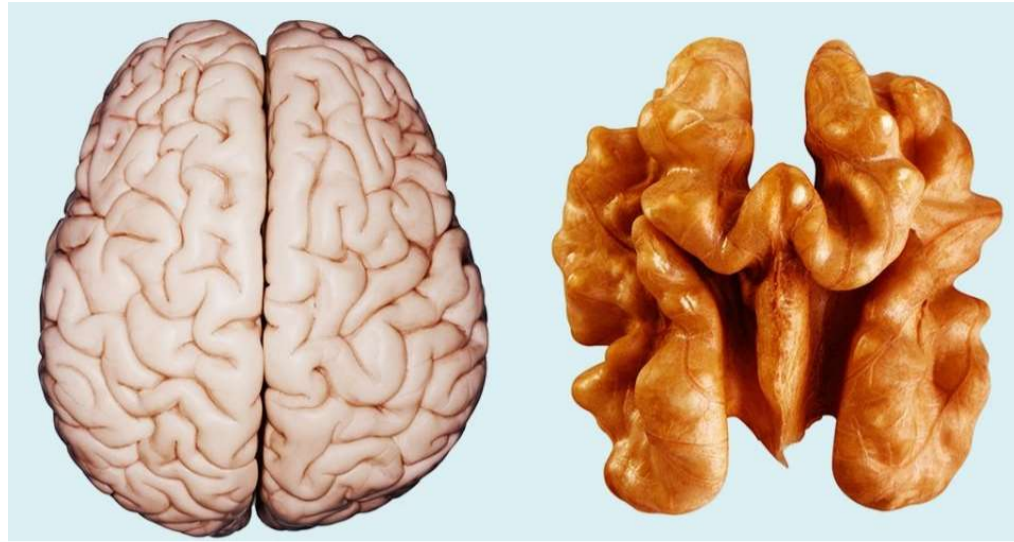
Activity 2:

 12 minutes

1. Now ask them:
 - Have you ever seen a brain?
 - Where is the brain situated?
 - Is it a singular/whole structure or does it have portions?
 - Put your hands on your forehead, move them slowly on your head till your neck and try to feel it?



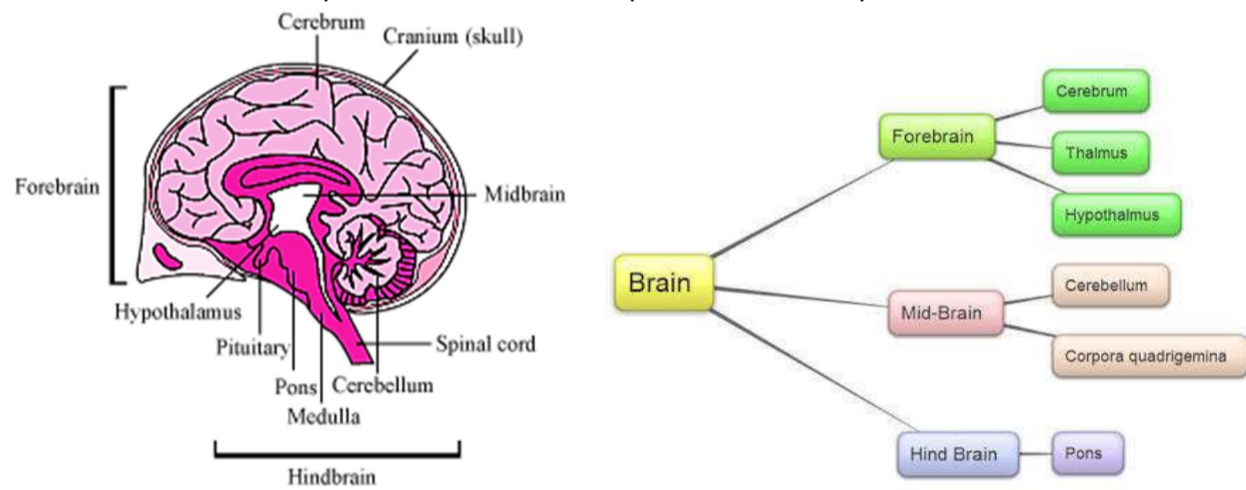
2. Ask them to repeat it 2-3 times and tell their observation.
3. Now ask them a riddle?



4. Name a dry fruit whose shape resembles to our brain? (walnut)
5. Now give them peeled walnut or show its slide or draw on board.
6. Ask them all to observe it carefully as structure of brain and then tell their partner that what they observed about it.
7. Take few responses from them and tell that:

Just like walnut
 Brain is divided into 2 parts. Each called a Hemisphere.
 It is divided into different parts.

8. Show them the model/the relevant slide/poster, or draw on the board the diagram of human brain and explain them its different parts with the help of flowchart.

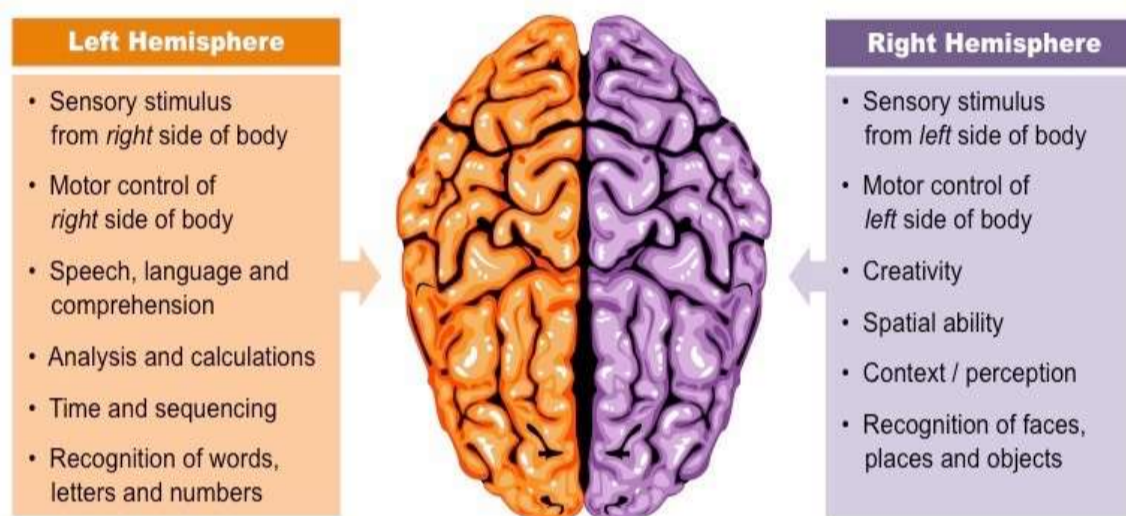


9. Brain is enclosed in a hard and bony cover called the Cranium or the Skull.
10. It is divided into three main parts.
 - Forebrain (Cerebrum)
 - Mid brain
 - Hind brain

1. Show them the following poster.

YELLOW BLUE ORANGE
BLACK RED GREEN
PURPLE YELLOW RED
ORANGE GREEN BLUE
BLUE RED PURPLE
YELLOW RED GREEN

2. Tell them that I will put my finger on a colour and you all have to tell the colour not the name (example First line will be read as Green, red and blue)
3. Now start it slowly and increase your speed gradually.
4. Most of the participants will read the name not the colour.
5. Now ask them that why it happened.
6. Give a pause ,let them think, Take few responses and
7. Show the relevant slide/ poster or draw the diagram of the cerebrum on board and write the information in bullets.
8. Discuss in detail with the role of left and right hemispheres and tell them the functions they control.



9. Now ask them to guess that which part of the brain helped them to tell the colour and which part was working to read what is written.
10. Go back to your chart /PPT , put your finger on any colour and explain that

Orange

Left side of brain will read it orange and right side as blue.



1. Now to start the next concept with the general example of a control room from daily life.
2. Ask them:
 - Have you ever heard about control rooms in any system?
3. Listen to them and elaborate about control rooms of airport, railway station.TV etc.
4. Then ask:
 - Who gives information to the control room?
 - How does the control room get information?
 - How do information/signals travel?
5. Take responses, conclude that how control center works and relate the explanation with the working of human nervous system.

- ✓ A Control Room depends upon its workers for controlling a system.
- ✓ It gets messages from its detectors, processes information, and gives instructions through messengers to the workers who act accordingly.
- ✓ Nervous system also works in the same way.
- ✓ It receives information through our senses called Receptors
- ✓ processes the information through Central nervous system (Brain, Spinal cord)
- ✓ and triggers reactions through effectors, such as making your muscles move or causing you to feel pain. For example,

6. Show them the relevant slide or write keywords on the board.

Receptors	Sense organs	Feel / Send signals
Stimulus		
Sensory neurons		
Central Nervous system		
Motor Neurons		
Effectors		

7. Ask participants what they know about these words.

Receptors	Sense organs	Feel / Send signals
Stimulus	Change in external or internal environment	Temperature Hunger Danger
Sensory neurons	Carry message	From sense organs to the brain
Central Nervous system	Processes the message and gives instructions	Brain
Motor Neurons	Carry instructions	From brain to the body parts (effectors)
Effectors	Muscles or glands	Give reaction

8. Show the relevant slides or ask examples for each word.
9. Conclude at the end by showing the relevant slide or the complete table on the board.
10. After clearing the role of each part, discuss the stimulus response pathway for a particular situation.
11. Ask participants to read **Textbook science grade 8 page 19, 20** and discuss with each another (open discussion).
12. Take a round to witness their discussion and help, if required, to clear their concept.
13. Now write a situation on the board. **(Your new shoes are in the lawn. All of sudden rain starts. You rush to bring your shoes inside.)**
14. Ask participants to formulate the stimulus response pathway for this situation.(Individual task)
15. Make a flow chart of the stimulus response pathway on the board.

Stimulus response pathway Flow chart

Stimulus → Receptors → sensory neurons → Brain → Motor neurons → effectors → response

16. Ask participants to write names of parts of body in front of the every component, involved in this particular response.(See Board sample)

Board Sample

Situation:

Your new shoes are in the lawn. All of a sudden, the rain starts. You rush to bring your shoes inside.

Flow Chart

Stimulus → Receptors → sensory neurons → Brain → Motor neurons

Rain → eyes/ears → CNS → effectors → response → legs and You bring your shoes inside
→ arms muscles

17. Description:

- In this situation:
- Rain acts as stimulus.
- Eyes and ears are receptors
- Legs and arms are effectors and
- Final response is that you saved your shoes from the rain.

Activity 5:



10 minutes

1. Discuss the following situations with the participants
2. What happens?
 - When mistakenly you touch a hot object.
 - While walking, a sharp object comes under your foot.
3. Take their responses and
4. Ask participants to read the mechanism of Reflex Action from the **Textbook general science grade 8 at page 26** (pair activity)




5. Help them to understand the pathway of a reflex arc with the help of diagram from the book.
6. Discuss the pathway with them.
7. Explain them that:

An immediate and involuntary response is called a reflex action e.g. quick pulling of one's hand just after touching a hot object,

These responses are controlled by the spinal cord.

It means that for the reflex action, instructions are given by the spinal cord, not by the brain.

Activity 6:

 12 minutes

1. Now involve the participants into this role play activity.
2. Write all words of nervous system working model (receptors, stimulus, sensory neurons, CNS, spinal cord, motor neurons, effectors, action) on A4 papers. (If possible, make head bands by folding and stapling papers and write these names on them.)
3. Divide participants into 4-5 groups (number of groups may vary according to the total participants)
4. Give them different situations to perform, to show the working model of the nervous system.
5. Each member will hold one card and act for its role.

Examples:

1. Situation:
 - Feeling very cold
2. Solution / Action
 - Take a blanket or switch on the heater

Role Play

Stimulus will say "Today I'll freeze them all with cold wind".

1. Receptor will say to the sensory neuron " I am feeling cold "
 2. Sensory Neuron tell the CNS (Receptors are telling that they are feeling cold).
 3. The CNS will ask the motor neurons to tell to the effectors about the solution.
 4. The motor neurons go to the effectors and tell them to cover the whole body and switch on heater).
 5. The motor neuron will deliver the message to the effectors
 6. The effectors will act to cover the body and switch on the heater.
6. Suggested Situations
 - Feeling cold
 - Danger

- Touching a hot object
 - Seeing a snake nearby
7. To cover the activity in minimum time, you can ask one group to suggest a situation and the other group to enact it.
 8. As the participants are settling after the role play, walk towards the switch board and switch off the fan.
 9. This act will drag the participant's attention towards the fan.
 10. Now ask them;
 - What will happen if the connection of this fan is broken?
 - What do you think what happens if a nerve connection is broken?
 - If any part of body is unable to move, what is that situation called?
 11. Take their responses and then explain that:

- ✓ A nerve connection works just like an electric connection.
- ✓ Network of nerves in our body is just like an electric cable wiring in our houses.
- ✓ Each socket needs its own connection with a main supply.
- ✓ If it is broken, that socket will not work.
- ✓ Similarly, nerves connect the Central Nervous System to all parts of body. Every organ has its own connection. (Recall the functions of the left and right hemispheres)
- ✓ If any part of body is unable to move, that situation is called Paralysis.

CONCLUSION / SUM UP/ WRAP UP:

 05 Minutes

1. Invite participants to ask questions on anything that they do not understand.
2. Discuss these to clarify the concepts if needed.
3. Wrap up the session by recalling all the points with the involvement of participants.



Key Points

- ✓ The nervous system carries messages from one part of the body to another and coordinates the body's functions.
- ✓ The central nervous system consists of the brain and the spinal cord.
- ✓ The peripheral nervous system consists of a network of nerves which connects the central nervous system to all the body parts.
- ✓ Sensory neurons carry messages from sense organs to central nervous system.
- ✓ Motor neurons carry messages from central nervous system to muscles and glands.
- ✓ Inter neurons are present in the brain and spinal cord. They form a link between a sensory neuron and a motor neuron.
- ✓ An immediate and involuntary response to a stimulus is called a reflex action.



1. Ask the participants to open textbook page No 24, Q. No. 3 (i)
2. Ask them to solve and discuss with each other
3. Ask answers orally from the whole class to cross check their work.

Page 24 Q #3 (Answers)**Constructed response questions.**

- (i) The table below shows the list of your daily activities. Write the name of that part of the brain (forebrain, mid brain or hind brain) which is controlling this activity.

No.	Activity	Part of brain controlling activity
1.	Sleeping	Forebrain
2.	Brushing your teeth	Forebrain
3.	Taking the breakfast	Forebrain
4.	Balancing your body	Hind brain
5.	Taking deep breath	Hind brain

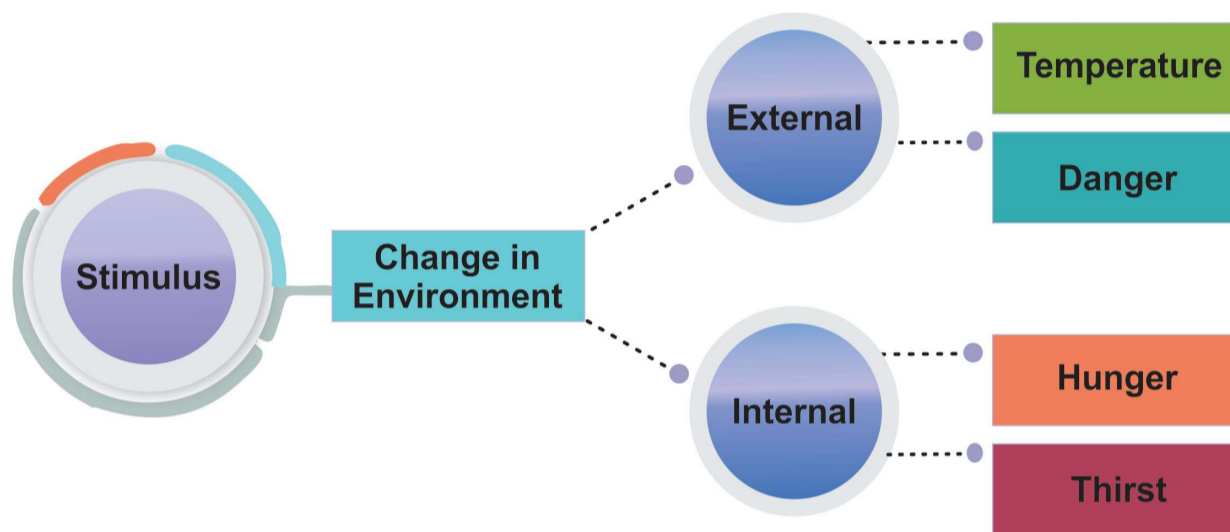
4. Divide the whole class into 2 groups
5. Give each a part of Q#4
 - (i) Why is a motorcyclist advised to wear a helmet?
 - (ii) A person has a car accident. When he was brought to the hospital, he could not even remember his own name? What might have happened to him? Relate your answer with reference to the nervous system.
6. Discuss both situations one by one, let them all tell their suggested solutions.
7. End the lesson by telling them the right answers.

Answers:

1. For the protection of the brain.
2. This situation is called Amnesia, in which memory is lost due to the damage of multiple parts of brain. (concussion)
It could be temporary or permanent, depending upon the seriousness of damage.

8. Use the last 5-6 minutes for a general discussion
9. Ask if still they have any question
10. Ask them to fill the last part (L) of the KWL chart
11. Close the sessions with greeting

Flash Cards samples



Sensory Neurons
Take messages from receptors to the Central nervous system
Central Nervous System
Processes and gives instructions
Motor Neurons
Take message from CNS to the effectors



Effectors

Follow Instructions and take action

Responses

Running because of danger

Covering body from cold

Take food out of hunger

Video links for additional support

<https://youtu.be/KZVeFTDszTs><https://youtu.be/KZVeFTDszTs>

https://youtu.be/ndDpjT0_IM0

<https://youtu.be/rVDZYQOoeHw>


STUDENT LEARNING OUTCOMES

By the end of the session, participants will be able to:


1. state the importance of digestion in the human body and describe physical and chemical digestion:
2. briefly describe the role of enzymes in digestion:
3. conclude that blood transports the product of digestion to other parts of the body and the undigested products get egested/ defecated:
4. briefly describe some major digestive disorders:

MATERIALS

- Writing Board
- Marker / Chalk
- Textbook General Science - 6
- Multimedia
- Flip charts
- Jaggery (gurr) ^{جگر}
- Hand-outs


Opening 05 minutes

1. Ask participants:
 - What challenges do you face during teaching “The Digestive System”?
2. Take their responses and share the learning outcomes of the session PPT slide or verbally.

Activity 1: 05 minutes


1. Warm up questions:
 - What did you take for breakfast today?
 - Why does the body need food?
 - Does my tongue need energy?
 - Do my hands need energy?
 - How do we get this energy?
2. After getting responses from a few participants, discuss **PPT slide**
 - ✓ The body needs food to get nutrients for energy, growth and cell repair.
 - ✓ Food must be broken down into smaller molecules of nutrients before they can be absorbed into the blood and carried to cells throughout the body.
 - ✓ This process is called digestion.



Activity 2: **10 minutes**


1. Digestive system: 3 mins 20 seconds
<https://www.youtube.com/watch?v=bFczvJp0bpU>
 - Show the video and ask participants why is digestion important?
2. Elaborate the concept by using **PPT Slide**

- ✓ When you eat foods such as bread, meat, and vegetables, they are not in a form that the body can use for energy.
- ✓ Food and drink must be changed into smaller molecules of nutrients before they can be absorbed into the blood and carried to cells throughout the body.
- ✓ Digestion is the process during which large and complex food molecules are broken down into such smaller pieces which can pass across the walls of the small intestines and be absorbed into the blood, so the body can use them to build and nourish cells and to provide energy.

Activity 3: **10 minutes**

1. Close your eyes, take a small piece of jaggery (gurr) گڑ. Put it in your mouth. What have you done unconsciously? Open your eyes
 - What happens when you bite a small piece of jaggery?
 - What will happen if you do not chew the jaggery?
 - What will happen if you try to swallow it?
 - What will happen if you mix it in water?
 - What happens to the food after you eat it?
2. After getting responses from participants, tell that: **PPT Slid**

- ✓ When we bite a piece of jaggery it will be crushed and grinded by teeth to break it into smaller parts. The crushing and grinding of food into smaller parts by the teeth is called physical digestion.
- ✓ If you try to swallow the piece of jaggery without chewing you might choke.
- ✓ As saliva will mix with the jaggery chemical changes will take place leading to chemical digestion.
- ✓ When food is changed from non-diffusible (insoluble) molecules to diffusible or (soluble) food molecules with the help of chemical substances (enzymes) it is called chemical digestion.
- ✓ Complete digestion comprises of two processes physical digestion and chemical digestion.

Activity 4: **16 minutes**

1. Whole class discussion
 - What is the equipment that facilitates us in preparing Chutney/ Milk shake
 - Take responses from the participants and write it on the board.

Expected responses:

 - Pastel mortar, blender
 - If a blender or pastel mortar were not available what would we do?

Expected response:

- We will not be able to make a smooth chutney
- What was the role of the blender in this case?

Expected response: It speeded up the process.

2. Tell the participants that the blender facilitated in making a smooth paste of chutney. The blender speeded up the process without being consumed in it.

- ✓ Similarly enzymes play the role of a blender in facilitating to speed up the rate of chemical reaction during the process of digestion without being consumed or taking part in the chemical reactions.
- ✓ Enzymes are proteins in nature and work as catalysts only.

For more concept clarity and comprehension of the concept watch the following video.

<https://www.youtube.com/watch?v=6jz9WvfKDvc>

3. After watching the video ask the following questions:

- What would happen if there were no enzymes in our body?
- How do enzymes work?
- What is the role of enzymes in digestion?


4. Distribute the handout No. 1 - Enzymes. Reference reading material for later reading

5. To elaborate and sum up the topic on enzymes use **PPT Slides**

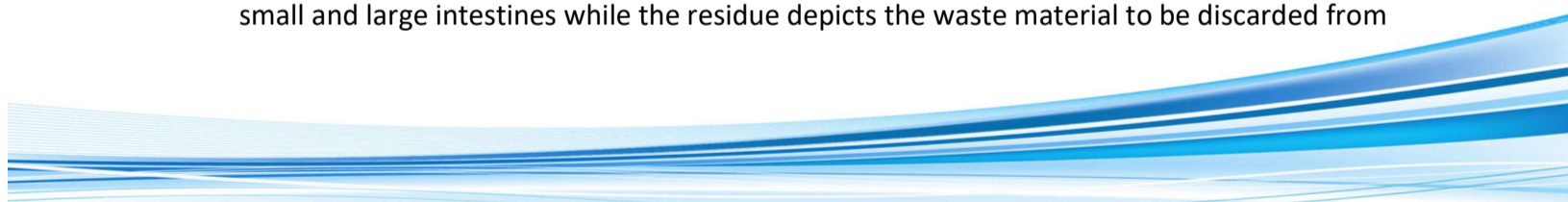
6. Conclude the session by sharing the following points:

- ✓ Enzymes are proteins in nature. They speed up the rate of chemical reaction without being consumed or taking part in the chemical reaction. Enzymes work as catalysts only.
- ✓ Digestive enzymes are produced naturally in human body. They play a key role in breaking down the food into its nutrients in a form that they can be easily absorbed by the wall of small intestine during the process of digestion.
- ✓ Biological catalysts, enzymes, are extremely **specific** in their functions. They catalyze a single chemical reaction or some closely associated reactions. Enzymes are commonly named by adding a suffix “-ase” to the root name of the substance molecule they naturally act upon. For example, Lipase catalyzes the hydrolysis of lipids, they break down the molecule with the help of water; Sucrase catalyzes the hydrolysis of sucrose into glucose and fructose.
- ✓ Amylase is produced mostly in the pancreas, but also in the salivary glands and small intestine. **Amylase** breaks down starches and carbohydrates into sugars.
- ✓ Protease is produced in the stomach, pancreas, and small intestine. **Protease** breaks down proteins into amino acids.
- ✓ Lipase is produced in the pancreas and small intestine. **Lipase** breaks down lipids, which are fats and oils, into glycerol and fatty acids.
- ✓ All enzymes help to break large molecules of proteins, fats and carbohydrates into soluble form to be absorbed by the walls of the small intestine.

Activity 5:

 **20 minutes**

1. Prepare a suspended solution of sand and water. Stir the mixture and pass it through a filter paper. The solution in the beaker shows the digested food to be readily absorbed by the small and large intestines while the residue depicts the waste material to be discarded from



the body.

2. Ask the following questions to lead discussion on transport of food in human body.
3. Pose the following questions one by one. Allow the participants to discuss in pairs.
4. Invite the pairs to answer
 - Into what form is the food converted in the small intestine?
 - What is starch converted into?
 - What are proteins converted into?
 - What are fats and fatty acids converted into?
 - How will they be transported to all the body parts?
 - What happens to the undigested food?
5. To elaborate the transportation of nutrients throughout the body refer to PPT Slides
6. Conclude the discussion by sharing the following points and making a flowchart on the board with students' input.

- ✓ Food from the stomach enters the small intestine. Gall bladder secretes bile and the pancreatic juice from the pancreas complete the digestion in the small intestine
- ✓ The second part of small intestine have finger like projections called villi which contain many blood vessels
- ✓ Digested food is converted into such smaller particles that can diffuse through the walls of the villi and pass into the blood stream.
- ✓ Starch is converted into simple sugars, proteins into amino acids and fats and fatty acids into glycerol. All these can easily diffuse in the cells where they are either used to produce energy or stored as nutrients required for growth and other vital functions.
- ✓ Blood transports the products of digestion i.e. the nutrients to all parts of the body for energy, growth and cell repair.
- ✓ The undigested food is passed out through the anus from the large intestine.

Activity 6:



12 minutes

1. Divide the class into groups and assign one disorder of digestive system to each group.
2. Ask them to read the "Disorders of digestive system", from **textbook General Science-6 on page 48.**
3. Read the information for the assigned disorder, add own experiences and prepare a role play for the disorder assigned.
4. Conclude the discussion with the following points: PPT Slides

Diarrhea:

- ✓ **Symptoms:** there are waves of muscular contraction passing fast along the intestine. Semi-liquid faeces are passed out of the body.
- ✓ **Causes:** food in the large intestine is contaminated with toxic matter or infected with bacteria. It stimulates the waves of muscular contraction passing along the intestine at a fast speed resulting in shortage of water in the body (dehydration).
- ✓ **Remedy:** use of ORS or salt and sugar solution
- ✓ **Precaution:** wash your hands properly before eating to avoid bacterial infection. Avoid street food as it may be unhygienic.

Constipation:

- ✓ **Symptoms:** constipation occurs when bowel movements become less frequent and stools become hard and difficult to pass. There is severe pain when stool is passed you may blood in your stool, constipation may last longer than three weeks.
- ✓ **Causes:** it happens most often due to changes in diet or routine or due to inadequate intake of fiber.
- ✓ Food moves too slowly along with the large intestines, more water is absorbed into blood and faeces become hard and dry.
- ✓ Remedy drink two to four extra glasses of water a day. Avoid caffeine-containing drinks which can cause dehydration. Add fruits, vegetables whole grains and other high-fiber foods to your diet. Eat fewer high-fat foods, like meat, eggs and cheese. Eat prunes and/or bran cereal. Keep a food diary and single out foods that constipate you. Get moving, make a routine of exercise.

Ulcer:

- ✓ **Symptom:** there are sores on the lining of stomach, small intestine or esophagus.
- ✓ **Causes:** excessive use of fast food and fizzy drinks cause ulcers
- ✓ **Remedy:** avoid use of fast food and fizzy drinks. Avoid hot food especially chili sauces.
- ✓ Consult the doctor immediately.

CONCLUSION / SUM UP/ WRAP UP:



05 Minutes

1. Recap the concept with the help of a video on Digestive system
2. Digestive system: 3 mins 20 seconds
<https://www.youtube.com/watch?v=bFczvJp0bpU>
3. Conclude the session by using following key points **PPT Slides**

- ✓ The process during which large and complex food molecules are broken down into such smaller pieces which pass across the walls of small intestines and absorbed into the blood is called **digestion**.
- ✓ Complete digestion of food comprises of two processes i.e. **physical digestion and chemical digestion**.
- ✓ **Enzymes** are special type of proteins in our body that speed up the different chemical processes. They are specific in their function.
- ✓ **Amylase, lipase, protease**, etc., are the examples of some enzymes that are involved in digestion of food.
- ✓ Digestive enzymes convert starch into simple sugars, proteins into amino acids and fats into fatty acids and glycerol.
- ✓ Bile is produced in liver and stored in the gall bladder, pancreatic juice is produced by pancreas, and Bile breaks large drops of fats into small droplets. Digestion and absorption of food is completed in small intestine.
- ✓ After digestion nutrients are absorbed by walls of the villi in the small intestine from where it enters the blood stream and transported to all parts of the body through blood
- ✓ In large intestine, salt, water and minerals are absorbed.
- ✓ Undigested food is converted into faeces which is removed from the body through

the opening of the rectum called anus.

ASSESSMENT



07 Minutes

1. Use the given assessment sheet to assess the participants understanding
2. Distribute assessment sheet to the participants Handout – 2
3. Ask them to solve it
4. In the end share the correct answers with the participants.
5. Ask participants to self-assess their work.

Handout No. 1

Enzymes

Enzymes are proteins in nature and speed up the rate of chemical reaction without being consumed or taking part in the chemical reaction. Enzymes work as catalysts only.

Digestive enzymes are produced naturally in human body. They play a key role in breaking down the food into its nutrients in a form that the digestive tract can easily absorb during the process of digestion.

Biological catalysts, enzymes, are extremely specific in their functions. They catalyze a single chemical reaction or some closely associated reactions. Enzymes are commonly named by adding a suffix “-ase” to the root name of the substrate molecule they naturally act upon. For example, Lipase catalyzes the hydrolysis of lipids, they break down the molecule with the help of water, sucrase catalyzes the hydrolysis of sucrose into glucose and fructose.

Saliva has digestive enzymes in it. Some of the organs, including pancreas, gallbladder, and liver, also release enzymes.

What do enzymes do?

Enzymes increase the rate of chemical reactions without themselves being consumed or permanently altered by the reaction. Enzymes are produced naturally in the body and help with important tasks, including:

- building muscles
- destroying toxins
- breaking down food particles during digestion

How digestive enzymes work?

Enzymes are required for proper digestive system function. Without the combined actions of our digestive enzymes we would simply be unable to absorb many nutrients that we need to maintain good health.

There are many different types of digestive enzymes, there are three main types produced in the pancreas, an organ that does a lot of the working during digestion. These digestive enzymes are categorized based on the reactions they help catalyze:

- **Amylase** breaks down starches and carbohydrates into sugars.
- **Protease** breaks down proteins into amino acids.
- **Lipase** breaks down lipids, which are fats and oils, into glycerol and fatty acids.

Amylase

Amylase is produced mostly in the pancreas, but also in the salivary glands and small intestine. One type of amylase, called ptyalin, is made in the salivary glands and starts to act on starches while food is still in the mouth. It remains active even after you swallow.



Pancreatic amylase is made in the pancreas and delivered to the small intestine. Here it continues to break down starch molecules to sugars, which are ultimately digested into glucose by other enzymes. This is then absorbed into the body's blood circulation through the wall of the small intestine.

Protease

Protease is produced in the stomach, pancreas, and small intestine. Most of the chemical reactions occur in the stomach and small intestine. In the stomach, pepsin is the main digestive enzyme that attacks proteins. Several other pancreatic enzymes go to work when protein molecules reach the small intestine.

Lipase

Lipase is produced in the pancreas and small intestine. Lipids play many roles, including long-term energy storage and supporting cellular health.

An enzyme's shape is tied to its function. Heat, disease, or harsh chemical conditions can damage enzymes and change their shape. When this happens, an enzyme doesn't work anymore. This affects the body processes that the enzyme helped to support.

Answer the questions given below:

1. Give a reason to support the notion "Enzymes are specific in their functions"
2. How are enzymes named?
3. Where is amylase, protease and lipase produced
4. State the function of amylase, protease and lipase.

Handout No. 2
Assessment sheet
(Digestive System)

Choose the correct option.

1. In humans most of the digestion takes place in:
a. mouth b. esophagus c. stomach d. small intestine
2. Saliva is produced in:
a. oral cavity b. esophagus c. stomach d. small intestine
3. Digestive enzymes convert starch into:
a. fatty acids b. minerals c. vitamins d. simple sugars

Give short answers

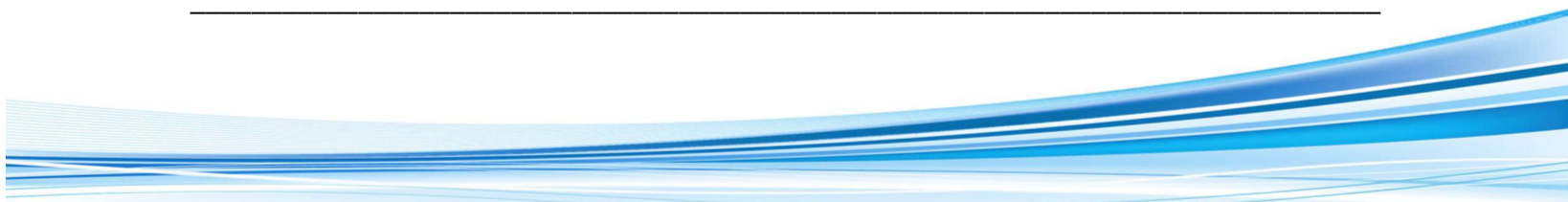
1. Define chemical digestion.

2. How is chewing important in human digestive system?

3. How is small intestine important in digestive system of humans?

4. Why is your digestive canal long?

5. How are the nutrients transported to different parts of the body?





STUDENT LEARNING OUTCOMES

By the end of the session, participants will be able to:

1. explain that living organisms have a complex transport system for the transfer of various solids, liquids, and gases across the body.
2. describe the structure and function of the human heart.
3. explain how blood circulates in the human body through a network of vessels (arteries, veins and capillaries), and transports gases, nutrients, wastes and heat.
4. compare and contrast arteries, veins and capillaries.
5. describe the composition of blood and the functions of red cells, white cells, platelets and plasma.

MATERIALS

- Textbook Science Grade- 7
- Writing board, Board marker / Chalk
- Multimedia, Multimedia slides, Video, Power source
- Posters (Heart, Blood vessels, Blood circulation)
- Electric tape, Scotch tape, Two caps of PVC pipe, Threads, Small balloons, Two large balloons, One foaming ball, IV set (two sets with pipes)
- Question chits / Question chart, flipcharts
- Flowchart, Handouts, Worksheet and Evaluation sheet

Opening



05 minutes

3. Ask the participants about their expectations of the session.
4. Share the learning outcomes of the session with the participants.
5. Use board or a relevant PPT Slide for this purpose.

Activity 1:



06 minutes




1. Show the above picture to the participants and ask them;

- What they can infer from the picture.
2. Lead the discussion by asking the participants to think about the importance of a transport system in a country.
 3. After getting responses, ask the participants to relate a transport system of a country with the human body transport system.
 4. Focus the participants' attention on the subject matter by asking thought-provoking questions:
 - What does a transport system in a country use to transport?
 - What materials does the human transport system transport?
 - What is the human transport system known as?
 5. Take 3-5 responses randomly. Encourage the learners to active participation.
 6. After getting responses, sum up this activity by using the given points.

- ✓ Transport system in a country works to pick up and drop off people at their destination.
- ✓ Similarly, the transport system within a living body helps to pick and drop essential substances and waste substances to their destination.
- ✓ In simple organisms, this process is conducted by simple diffusion whereas the higher multicellular organisms require a complex system, called circulatory system.
- ✓ Recall the process of diffusion by telling that it is a physical process that refers to the movement of molecules from a region of higher concentration to a region of lower concentration.

Activity 2:

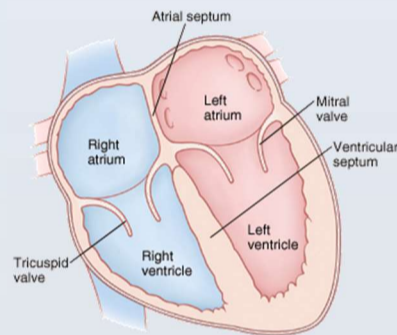
 20 minutes

1. Start a short whole-class discussion about the heart by asking them to put their hands on the chest and share what do they feel? (heart beat)
2. Lead the discussion by asking the following questions.
 - Where is the heart located?
 - What is the shape of the heart?
 - What is the approximate size of the heart?
 - Name the protective covering of the heart.
3. After taking the response, conclude the activity by using given points.
 - ✓ The heart is located in front of the chest cavity between the two lungs and is slightly on the left of the center, protected by a ribcage.
 - ✓ The heart is conical shaped.
 - ✓ It is approximately the size of our fist.
 - ✓ It is protected by a double-layered transparent membrane called pericardium.
4. Invite the participants to share their current understanding of the heart's structure and function.
5. Divide the participants into groups with 3-4 participants in each group.
6. Invite them to explore the content by reading "Heart" and "Working of the Heart" from pages 25, and 26 of the Textbook General Science-7



7. Allocate 5 minutes for this task and ask them to note down key points.
8. After completing their group work, ask a few groups randomly to share their findings.
9. Elaborate the concept by using relevant PPT slides and by playing a relevant video given (British Heart Foundation – How does a healthy heart work? <https://www.youtube.com/watch?v=ep4cQrYFL0w>) / by drawing a diagram of the heart on the board / by using posters.
10. Conclude the concept by using the given points.

- ✓ The heart has four chambers: left ventricle, right ventricle, left atrium, and right atrium.
- ✓ The left and right ventricles are near the bottom of the heart while the left and right atriums are at the top.
- ✓ The valves regulate the flow of blood between the atria and the ventricles.
- ✓ There are also two pumps that join together as one and are separated only by a wall of muscles, called the septum.
- ✓ Blood is pushed from the atriums and into the ventricles on each side of the heart as open and shut small valves. This happens during every heartbeat to ensure the blood flows in only one direction.
- ✓ To maintain the one-directional flow, the left side of the heart receives oxygenated blood coming from the lungs.
- ✓ It then sends the blood throughout the body through various blood vessels.
- ✓ Once the blood travels around the body, it returns to the right side of the heart.
- ✓ Then the heart sends the blood toward the lungs for more oxygen.




Note:

Share the links given below / given in the PPT Slide with the participants and ask them to watch these videos at home for more learning.

- ✓ How our heart works – Structure and Function (3D animation)
- ✓ <https://www.youtube.com/watch?v=46u2ON6d4mg>

Activity 3:

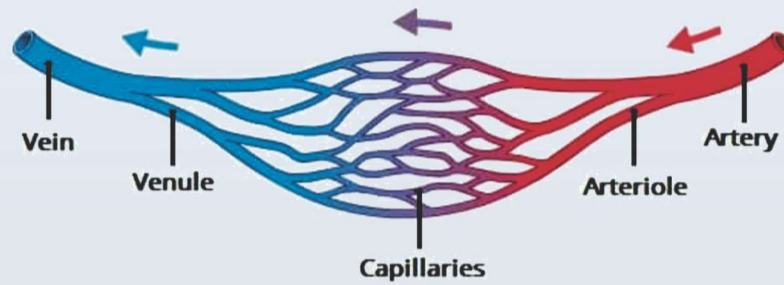
 **20 minutes**

1. Shift the participants' focus on the topic through the art of questioning
 - What is the backbone of the transport system of a country? (It is a network of roads).
 - How roads are connected with each other?
 - Relate the network of roads with a network of blood vessels in the human body.
2. Once the participants have shared their responses, describe the following points.

- ✓ In the transport system of a country, there are big roads which are known as highways. From the highways, vehicles move to the main roads and then they turn to small streets to reach their destination (home). These persons will be picked up or dropped. Then the reverse process will lead to the highway again.
- ✓ Similarly, in the human body, the arteries act as highways, which then divide into arterioles and then re-divide into capillaries where the materials are picked up and dropped off by the blood. Then the reverse process occurs. The capillaries join to form venules and rejoin to form veins.

3. Interact with the participants to gather their input where they provide responses and write the names of three types of blood vessels on the board.
4. Elaborate on the concept by using a **PPT slide**/ by using posters /by drawing a diagram of the blood vessels on the board.
5. Build the concept by using the given information:

- ✓ Blood vessels are the channels that carry blood throughout the body.
- ✓ There are three types of blood vessels, i.e. arteries, capillaries and veins.
- ✓ Arteries are thick-walled blood vessels that carry blood away from the heart.
- ✓ Arteries are further divided into arterioles.
- ✓ Arterioles are then further divided into tiny capillaries which are one cell in thickness.
- ✓ It is a point where exchange of material takes place between the blood and the tissue.
- ✓ Capillaries then re-unite to form venules which join to form big veins.



6. Prepare the "**Working Model of the Heart**" in advance and utilize it during the session to illustrate how the heart pumps blood, which is transported by arteries to nourish the body and subsequently returns to the heart through veins.
7. Create a "Working Model of the Heart" by following the provided procedure or by using the provided link to access detailed instructions.



Materials needed:

- ✓ Electric tape
- ✓ Scotch tape
- ✓ Two caps of PVC pipe
- ✓ Threads
- ✓ Small balloons
- ✓ Two large balloons
- ✓ One foaming ball
- ✓ IV set (two sets with pipes)

Procedure

- ✓ Begin by making the valves of the heart. Take the PVC pipe caps and make two holes (3mm) in each cap using a drill machine. The holes should be a small distance apart.
- ✓ Cut a 1-inch section of the drip pipe and insert it into one of the holes in the PVC cap. Attach a small balloon to the end of the drip pipe to create a valve. Secure the balloon with tape.
- ✓ Repeat step 2 to create the second valve using the other PVC cap and drip pipe.
- ✓ Cut the foaming ball into two pieces using a knife. Cut a smaller portion from one of the pieces and create an opening for water to come out.
- ✓ Attach one of the PVC pipe caps (with the valve) to the cut foaming ball using glue. Cover the ball with a larger balloon or a plastic bag and tie it tightly with thread.
- ✓ Apply a layer of electric tape over the balloon to provide stability and prevent it from deforming under pressure.
- ✓ Repeat steps 4-6 to create the second half of the heart model.
- ✓ Test the model by pouring water mixed with red color into a container. Dip the suction pipe (with the valve) into the water and press the foaming ball. The water should be sucked into the model and then released when the pressure is released.
- ✓ Attach the two halves of the heart model using transparent tape. Make sure they remain separate and function independently.
- ✓ Apply more force to the model to observe its working.
- ✓ Present the working model to demonstrate how the heart pumps blood.


New Working Model of Heart: https://www.youtube.com/watch?v=WufDTu_LpV0

7. Describe the concept briefly by using the relevant PPT slides and by playing a relevant video (Network of Blood Vessels: https://www.youtube.com/watch?v=mscAs_Gzv6k) /by using a poster /by drawing a diagram of circulatory system on the board.
8. Reinforce the concept by using given points.

- ✓ Blood is circulated to all parts of body through blood vessels by pumping action of the heart.
- ✓ Oxygenated blood that enters the left side of heart is ready to supply oxygen to all parts of the body.
- ✓ Heart pumps and supply this blood to all parts of body through arteries.
- ✓ Arteries divide and re-divide to form capillaries.
- ✓ Exchange of materials, i.e. gases, nutrients, wastes and heat take place between cells and blood through thin walls of capillaries. The blood become deoxygenated.
- ✓ This deoxygenated blood leads to veins which carry blood back to right side of the heart.
- ✓ The heart sends it to lungs for oxygenation.
- ✓ Oxygenated blood re-enters the heart which is again ready to supply this oxygenated blood to all parts of the body.
- ✓ Thus the cycle completes.
- ✓ This cycle repeats over and over again.

9. Divide the participants into groups.
10. Ask participants to write a pathway of blood flow through heart and blood vessels on flipchart and display in the class.
11. Appreciate the group that gives a correct presentation.
12. Show the pathway of blood to reinforce the concept by using a **PPT Slide or the given flow chart.**

Activity 4:

 12 minutes

1. Ask participants to read the table of comparison between arteries, capillaries, and veins given on **pg. No. 27 of General Science Grade 7**. Allocate 3 minutes for this task.
2. Clarify the role of arteries, capillaries, and veins by using the “Working Model of the Heart”.
3. Begin by explaining the function of arteries, capillaries, and veins to the participants. Arteries carry oxygenated blood away from the heart to different parts of the body, while veins bring deoxygenated blood back to the heart. Capillaries are tiny blood vessels that connect arteries and veins, allowing for the exchange of oxygen, nutrients, and waste products.
4. Use the working model of the heart to demonstrate the flow of blood. Point out the outlet pipe as the artery and the suction pipe as the vein. Explain that when the foaming ball is squeezed, it represents the contraction of the heart, pumping blood into the arteries.
5. Ask the participants to observe what happens when the foaming ball is squeezed. They should see the water being forced out of the outlet pipe (artery) into the container, representing the blood being pumped from the heart to the body. Then the suction pipe carries it back to the heart which acts as a vein.
6. Next, explain the role of capillaries in the circulation process. Use a dropper to place a few drops of colored water onto a sponge or absorbent material. Place the sponge in between the outlet pipe (artery) and the suction pipe (vein) of the model. Ask the students to observe what happens.
7. As the water spreads through the sponge, explain that it represents the transfer of oxygen, nutrients, and waste products between the blood in the arteries and veins. Emphasize that capillaries are responsible for this exchange, allowing the body's cells to receive oxygen and nutrients while removing waste products.

8. Show PPT slide No. 15 to the participants.
9. Write following questions on chits and put them in a box.
 - Why the arteries are thick-walled vessels?
 - Why does blood in the arteries have high blood pressure?
 - Why the arteries do not have valves?
 - Pulmonary artery carries deoxygenated blood, why is it still known as an artery?
 - Why the veins are thin-walled vessels?
 - Why does blood in the veins have low blood pressure?
 - Why do veins have valves?
 - Pulmonary vein carries oxygenated blood, why is it still known as a vein?
 - Why the capillaries are thin-walled vessels?
 - Why does blood in the capillaries have low blood pressure?
 - Why the capillaries do not have valves?
 - Why the exchange of materials can only take place in the capillaries?
10. Call the participants one by one and ask to pick up a chit from a box.
11. Ask them to read a chit and give reasoning by answering the question respectively.
12. Encourage the participants for active participation. Guide and correct them accordingly.

Activity 5:



10 minutes

1. Inquire about the means of transport in our country. (i.e. cars, buses, trains, airplanes, etc.)
2. Following the participants' responses ask them to indicate the medium of transport in the human body. (It is blood)
3. Ask the participants if they have had cut on any part of the body, did it bleed. What did the blood look like?
4. Use a PPT Slide /write the given question on a chart for board display.
5. Provide Worksheet # 1/ instruct the participants to copy these questions on a piece of paper to write answers later.
 - What does the blood do?
 - What are the parts of the blood?
 - Which is the most common blood cell in the body?
 - What is plasma?
 - What is the main component of RBCs?
 - What is the function of hemoglobin?
 - Why are white blood cells important?
 - Which part of the blood is made by the bone marrow?
 - What is the lifespan of RBCs?
 - What is the function of platelets?
6. Give them a few minutes to think and ask them to keep in mind these questions while doing the reading activity.
7. Introduce the 4 components of the blood, i.e. plasma, RBCs, WBCs, and platelets.
8. Describe the composition of blood by using a relevant **PPT slide**.
9. Explain that plasma is a yellow liquid with 92% water.
10. Explain the role of RBCs and hemoglobin by giving an example of a delivery service. Imagine RBCs and hemoglobin as a delivery service in your body. Just like a delivery person carries

packages from one location to another, hemoglobin molecules carry oxygen molecules from the lungs to different parts of your body. They ensure that every cell receives the oxygen it needs to function properly.


11. Discuss the role of white blood cells as soldiers in battle. White blood cells can be imagined as soldiers defending the body against invading armies. Just as soldiers fight against enemies to protect their homeland, white blood cells actively engage in battles against harmful pathogens, preventing infections and diseases.
12. Explain the platelets act as a crew repairing a damaged road. Imagine a road with a pothole or a crack. When the road is damaged, a repair crew comes in and fills the hole or seals the crack to prevent further damage and ensure the smooth flow of traffic. Similarly, platelets act as repair crews for damaged blood vessels. When a blood vessel is injured, platelets gather at the site, adhere to the damaged area, and promote clotting to stop bleeding.
13. Ask the participants to read the details of RBCs, WBCs, and platelets given on **pg. No. 29 of Textbook General Science-7**
14. Encourage them to ask questions if there is any difficulty to understand the concept.
15. Ask the participants to fill out the given **worksheet** or answer the questions that they copied before on a piece of paper.
16. Ask any volunteer to share the answers with the participants.
17. Instruct the participants to self asses their work.

Note:

Share the links given below / given in the relevant PPT Slide with participants and ask them to watch these videos by yourself to reinforce the concept of blood vessels and blood.

- ✓ What are blood vessels? / Blood circulation in human beings:
<https://www.youtube.com/watch?v=g68QzDBZmjE>

CONCLUSION / SUM UP/ WRAP UP:


 **07 Minutes**

1. Conclude the session by using the given key points.
2. Use the relevant **PPT Slide** / board for this purpose / share these points orally.

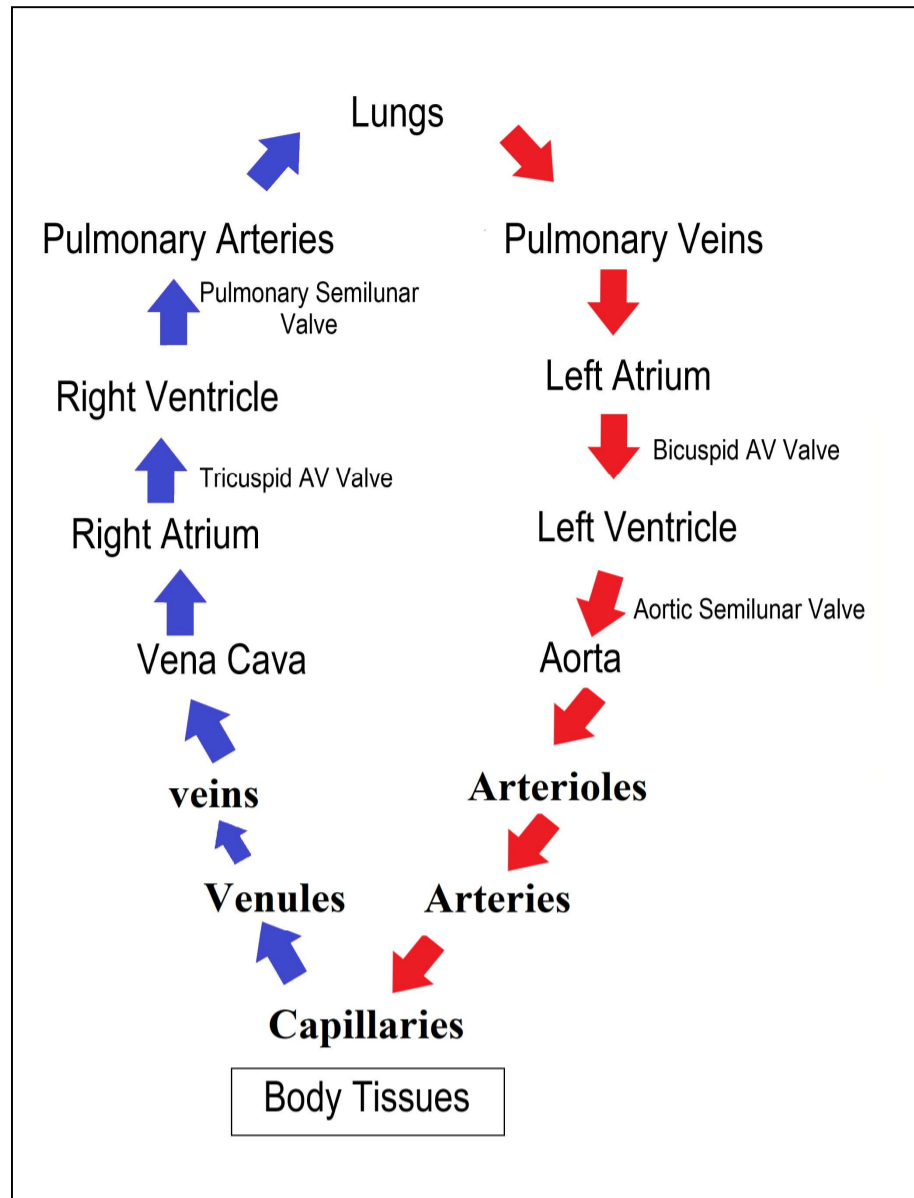
- ✓ Human transport system is known as a circulatory system.
- ✓ Circulatory system comprised heart, blood vessels and blood.
- ✓ Human heart has 4 chambers, two smaller atria and two larger ventricles.
- ✓ Arteries, capillaries and veins are three types of blood vessels.
- ✓ Blood contains plasma, RBCs, WBCs and platelets.
- ✓ Haemoglobin is iron-containing red pigment found in RBCs which carry oxygen.

ASSESSMENT

 **10 Minutes**

1. Use given **evaluation sheet** to assess the participants.
 2. Ask the participants to solve it.
 3. Share the correct answers with them.
 4. Ask the participants to self asses their work.
- 

Flowchart



Worksheet

1. What does the blood do?

2. What are the parts of the blood?

3. Which is the most common blood cell of the body?

4. What is plasma?

5. What is the main component of RBCs?

6. What is the function of hemoglobin?

7. Why are white blood cells important?

8. Which part of the blood is made by bone marrow?

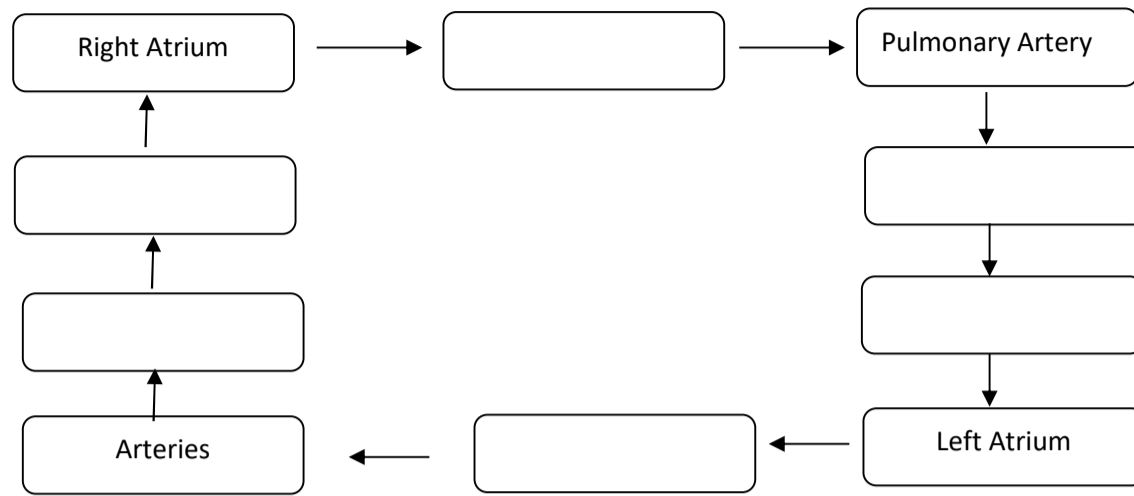
9. What is the lifespan of RBCs?

10. What is the function of platelets?



Evaluation Sheet

1. Complete the flow chart to show the pathway of blood in the human circulatory system.



2. Which statements about the arteries are correct?

- All arteries carry oxygenated blood. Arteries carry blood at high pressure.
 All arteries carry blood away from the heart. Arteries have valves.

3. Match the following:

a. Red blood cells
b. White blood cells
c. Platelets
d. Plasma

1. Defense against diseases
2. Carry nutrients & hormones
3. Carries oxygen
4. Clot the blood

4. Complete the following:

Together, the heart, blood, and blood vessels make the _____ system.
 The _____ pumps the _____ all-around the body. The human heart has _____ chambers. The heart has _____ that keeps the flow of blood in one direction. Blood is a mixture of _____ and _____. _____ blood cells have an iron-containing protein, called _____ which picks up _____. Blood is transported through _____. Arteries carry the _____ from the heart while _____ brings blood back to the heart. The exchange of materials between blood and cells takes place through _____.

Answer Key
Worksheet Questions Solutions

1. **What does blood do?** (Blood supplies useful materials to the cells and it also removes waste materials from them.)
2. **What are the parts of the blood?** (Plasma and blood cells)
3. **Which is the most common blood cell in the body?** (Red blood cells)
4. **What is plasma?** (Yellow liquid with 92% water)
5. **What is the main component of RBCs?** (hemoglobin)
6. **What is the function of hemoglobin?** (To carry oxygen from the lungs to all parts of the body)
7. **Why are white blood cells important?** (Help body to fight against diseases)
8. **Which part of the blood is made by the bone marrow?** (RBCs)
9. **What is the lifespan of RBCs?** (120 days)
10. **What is the function of platelets?** (Blood clotting)

Evaluation Sheet Solutions

1. Flowchart:

Right atrium - Left ventricle – Pulmonary artery – Lungs – Pulmonary vein – Left atrium –
Left ventricle – Arteries – Capillaries – Veins

2. Correct statements about the arteries.

Arteries carry blood at high pressure.


All arteries carry blood away from the heart.

3. Match the following:

A – 3 B – 1 C – 4 D – 2

3. Complete the following:

Together, the heart, blood, and blood vessels make the _____ (circulatory) system. The _____ (heart) pumps the _____ (blood) all around the body. The human heart has _____ (four) chambers. The heart has _____ (valves) that keep the flow of blood in one direction. Blood is a mixture of _____ (plasma) and _____ (blood cells). _____ (RBCs) blood cells have iron-containing protein, called _____ (hemoglobin) which picks up _____ (oxygen). Blood is transported through the _____ (blood vessels). Arteries carry the _____ (blood) from the heart while the _____ (veins) bring blood back to the heart. The exchange of materials between the blood and the cells takes place through the _____ (capillaries).



**STUDENT LEARNING OUTCOMES**

By the end of the session, participants will be able to:

1. differentiate between the characteristics of different planets;
2. differentiate between planets and dwarf planets;
3. investigate how artificial satellites have improved our knowledge about space and are used for space research;
4. describe the uses of various satellites in space i.e., geostationary, weather, communication, and Global Positioning System (GPS).

MATERIALS

- Writing Board
- Marker / Chalk
- Video / Poster of Solar System
- Multimedia
- Worksheet
- Handouts
- Textbook General Science-6

Opening

05 minutes

1. Ask the participants about their expectations from this session.
2. Share session learning outcomes with them.

Activity 1:

15 minutes


1. Write the word 'Solar System' on the board.
2. Tell the participants that we will discuss about solar system.
3. Give them 3-4 minutes to discuss in pairs.
4. Invite volunteers from different pairs to share about the solar system with the class.
5. Appreciate the participants for their participation.
6. Now show the following video to the participants.
<https://youtu.be/Qd6nLM2QIWw> or use the relevant PPT slide to display the following poster in the class.



7. At the end of this video, invite volunteers to tell about solar system.
8. With the help of the video or by using PPT slides/poster, conclude that:


- ✓ The solar system is made up of the Sun and everything that orbits around it. This includes planets, moons, asteroids, comets, and other objects.
- ✓ The eight planets that orbit the Sun are Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, and Neptune. These planets are very different from one another in terms of their size, composition, and distance from the Sun.
- ✓ The Sun is at the center of the solar system and is a massive ball of hot gas that provides heat and light to all the planets.
- ✓ The planets closest to the Sun (Mercury, Venus, Earth, and Mars) are known as terrestrial planets because they are small, rocky, and have solid surfaces.
- ✓ The planets which are further away from the Sun (Jupiter, Saturn, Uranus, and Neptune) are known as the gas giants because they are much larger and made mostly of gas and ice.
- ✓ Asteroids and comets are other important objects in the solar system.
- ✓ Asteroids are rocky objects that orbit the Sun, and comets are icy objects that also orbit the Sun but have a distinct tail that can be seen when they get closer to the Sun.
- ✓ The study of the solar system is important because it helps us understand our place in the universe and how the Earth and other planets were formed.
- ✓ By learning about the solar system, we can also gain insights into how life may exist elsewhere in the universe.

Activity 2:

 15 minutes

1. Divide the participants in groups with 3-4 participants in each group.
2. Assign each group a planet.
3. Instruct the groups to devise a role play, of no more than 2 minutes, to present the characteristics of the assigned planets.
4. Tell them that they can use their Textbook General Science-6
5. Take a quick round in the class, observe their work, and guide them where necessary.
6. Once the groups are ready, ask each group to present their role plays to share their findings on characteristics of the planets.
7. To reinforce the concepts, provide the participants with the worksheet- "Solar System" and instruct them to solve individually and then share with each other in pairs.
8. Tell the correct answers to the participants and instruct them to check their answers.

Activity 3:

 10 minutes

1. Write the following on the board;
2. Planets and Dwarf Planets
3. Inquire from the participants about the difference in planets and dwarf planets.
4. Encourage them to participate and involve maximum number of the participants.
5. Divide the participants in groups and instruct them to do brainstorming.
6. Give them 4-5 minutes for this task and tell them that they can use textbook **Grade 6 Page 137.**




7. At the end of brainstorming, ask one participant from each group to share his / her group findings about the difference between planets and dwarf planets.
8. Now conclude that, the main difference between a dwarf planet and a planet by using the relevant slides.

The planet is defined as a celestial body that:

- orbits the sun,
- has enough mass to form a spherical shape due to its own gravity, and
- has "cleared its orbit" of other debris, meaning that it has become gravitationally dominant in its region of the solar system.

In contrast, a dwarf planet is a celestial body that orbits the sun and has enough mass to form a spherical shape due to its own gravity, but it has not "cleared its orbit" of other debris. This means that it is not gravitationally dominant in its region of the solar system.

Activity 4:


 15 minutes

1. What is GPS?
2. How GPS works?
3. Encourage and appreciate them to share their views.
4. After getting their responses, show the following picture by using PPT Slides and introduce a satellite.



5. Tell them that satellites are objects that orbit around other objects in space.
6. There are many types of satellites, including natural satellites like the Moon, and artificial satellites that are created and launched into orbit by humans.
7. Earth and the Moon are examples of natural satellites.
8. Show the following video to the participants.
<https://youtu.be/5-8BTakSSTk>

Activity 5:

 20 minutes

1. Inquire from the participants about the uses of artificial satellites.
2. Instruct them to discuss in pairs and then one member from each pair will share with all participants.
3. Call three or four participants from different pairs to share their findings with the whole class.
4. Explain the concept by using the relevant PPT slides.

- Artificial satellites are commonly used to gather information about the Earth and its surroundings.
- Thousands of artificial, or man-made, satellites orbit the Earth. Some take pictures of the planet that help meteorologists predict weather and track hurricanes.
- Some take pictures of other planets, the sun, black holes, dark matter or faraway galaxies. These pictures help scientists better understand the solar system and the universe.

5. Divide the participants in groups of 4-5 members and provide them handout -Artificial Satellite.
6. Instruct them to read and discuss the uses and importance of artificial satellites in groups.
7. Give them 10 minutes for this activity.
8. Call each group to present their findings on a chart paper.

CONCLUSION / SUM UP/ WRAP UP:



05 Minutes

Involve the participants to recall and conclude the session that;

1. The solar system is made up of the Sun and everything that orbits around it. This includes planets, moons, asteroids, comets, and other objects.
2. The eight planets that orbit the Sun are Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, and Neptune.
3. The Sun is at the center of the solar system and it is a massive ball of hot gas that provides heat and light to all the planets.
4. Satellites are objects that orbit around other objects in space.
5. There are many types of satellites, including natural satellites such as the Moon, and artificial satellites. The artificial satellites are created and launched into orbit by humans.
6. Artificial satellites are commonly used to gather information about the Earth and its surroundings.

ASSESSMENT



05 Minutes

1. Instruct the participants to open page 142 of the Text book General Science- 6 and solve question 12.1 individually.
2. Take a quick round to observe their work and guide the participants where necessary.
3. Check their work and then solve all questions with the help of participants.



Handout No. 1

Solar System

1. Everything in the solar system revolves around the Sun. The Sun is a star—a massive ball of hot gas that gives off light and heat.
2. There are eight planets that orbit around the Sun.
3. The closest planet to the Sun is Mercury, and the farthest away is Neptune.
4. The biggest planet is Jupiter, and the smallest planet is Mercury.
5. The Earth is the only planet that we know has living creatures on it.
6. The Earth travels around the Sun in a loop that is shaped a bit like an oval. We call this the Earth's orbit.
7. The Earth also spins around on its axis and at the same time, it orbits the Sun. It takes one day to complete a rotation about the axis.
8. It takes 365 days for the Earth to complete one round around the Sun. We call this a year.
9. There is a lot of difference between the planets. Some planets like Earth are made of rocks, and some like Jupiter are made of gas.
10. The Sun is just one of hundreds of billions of stars in the galaxy that we live in, which is called, the Milky Way.
11. All of the planets and the Sun are round, like balls.
12. Not everything in the solar system orbits directly around the Sun. The Moon orbits around the Earth.
13. The Moon is a ball of rock that orbits around the Earth. In the same way the Earth orbits around the Sun. It is much smaller than the Earth and takes 28 days to complete one orbit.

Handout No. 2

Artificial Satellite

A satellite is a moon, planet or a machine that orbits a planet or a star. For example, Earth is a satellite because it orbits the Sun. Likewise, the Moon is a satellite because it orbits the Earth.

Earth and the moon are examples of natural satellites. Thousands of artificial, or man-made, satellites orbit the Earth. Some take pictures of the planet that help meteorologists predict weather and track hurricanes. Some take pictures of other planets, the sun, Black Holes, dark matter or faraway galaxies. These pictures help scientists better understand the solar system and the universe.

The satellites are used commonly for communications, such as beaming TV signals and phone calls around the world. A group of satellites make up the Global Positioning System (GPS). If you have a GPS receiver, these satellites can help figure out your exact location.

Why are satellites important?

Artificial satellites are of great importance for a variety of reasons. Here are some of the key reasons, why artificial satellites are important:

1. **Communication:** Satellites are used for long-distance communication, allowing people to communicate with each other from almost anywhere on the planet. Satellites enable global telephone and internet connectivity, and facilitate real-time communication between people in different countries.
2. **Navigation:** Satellites are used for navigation, both on the Earth and in space. GPS satellites provide precise location and timing information to the devices all over the world, enabling accurate navigation for cars, ships, and airplanes.
3. **Scientific research:** Satellites are used for scientific research in a variety of fields, including astronomy, meteorology, and earth science. They allow scientists to observe the Earth and space in ways that would not be possible from the ground.
4. **Military surveillance:** Satellites are used for military surveillance, providing valuable information to intelligence agencies about the potential threats and monitoring enemy activities.
5. **Weather forecasting:** Satellites are used to monitor weather patterns and track storms, providing important information for weather forecasting and disaster management.

Overall, artificial satellites are a critical component of modern life and play a crucial role in many different areas, from communication and navigation to scientific research and national security.



Worksheet: Solar System

Choose the correct answer.

1. If a celestial body moves around a planet or a star, it is called a natural.....of that planet or star.

- Star
- Sun
- Satellite
- Artificial satellite

2. The natural satellite of the Earth is called the

- Star
- Sun
- Moon
- Jupiter

3. A well-known example of a natural satellite is the.....the only natural satellite of the Earth.

- Moon
- Stars
- Sun
- Comets

4. Earth imaging, weather forecasting, telecommunication are done with the help of.....

- Sun
- Natural satellites
- Moon
- Artificial satellites

5. A man-made object moves which around a celestial body it is called a.....

- Asteroids
- Artificial satellite
- Star
- Natural satellite

Answer Key

1. Satellite
2. Moon
3. Moon
4. Artificial satellite
5. Artificial satellite

**STUDENT LEARNING OUTCOMES**

By the end of the session, participants will be able to:

1. Discuss the applications of biotechnology in the Pakistani context and their effects on the people and the environment of Pakistan over time e.g., bread-making, making of yogurt and cheese, vaccines for immunization, insulin production, dyes, etc.
2. Relate the use of biotechnology in food sciences in producing foods with higher nutritional value and improved taste and quality (how fermentation has been improved by genetically modified organisms or the introduction of certain genes to raise iron content in rice, can be taken as examples).

MATERIALS

- Textbook General Science- 8
- Writing board, Board marker / Chalk
- Multimedia, Multimedia slides, Video, Power Source
- Handout 1 & 2

Opening

05 minutes

1. Ask the participants about their expectations of the session.
2. Share the learning outcomes of the session with the participants.
3. Use board or PPT slide for this purpose.

Activity 1:

10 minutes

1. Encourage the participants to discuss what they know about biotechnology?
 - After getting random responses ask about some terms related to biotechnology to know their prior knowledge about the topic.
 - Write down key terms on the board (e.g. genetic engineering, transgenic organism/ genetically modified organisms, etc.) and ask students to define them.
 - Take 3-5 responses randomly. Encourage the learners to active participation.
 - After getting responses, sum up this activity by using PPT Slides / by using the given points orally.

- ✓ Biotechnology is the application of living organisms or their components to create useful products and processes for various industries.
- ✓ Biotechnology has been used for thousands of years, from pickles to making cheese, but recent advances in science and technology have greatly expanded its applications.
- ✓ Today, biotechnology has a wide range of applications in fields such as agriculture, medicine, environmental management, and food science.




- ✓ Biotechnology has the potential to revolutionize industries and improve the quality of life for people around the world.
- ✓ Genetic engineering is a process of manipulating an organism's DNA (genetic material) to introduce new traits or characteristics or to modify existing ones. The goal of genetic engineering is to produce organisms with desirable traits that are not found in nature, or to enhance or modify traits that are already present.
- ✓ A transgenic organism is an organism that has been genetically modified by introducing foreign DNA into its genome. It is also known as genetically modified organisms or GMO's.

Note:

Share the links given below / given in PPT Slides with participants and ask them to watch these videos at home for more learning.

- ✓ Introduction to Biotechnology – Don't memorise
- ✓ <https://www.youtube.com/watch?v=RrTCjp2015M>

Activity 2:

 **15 minutes**

1. Instruct the participants to familiarize themselves with the information presented on pages 41, 42, and 43 of the Textbook General Science -8 , specifically the section discussing the "Applications of Biotechnology. Allocate 7 minutes for this task.
2. Instruct them to take note of key points and engage in a class discussion about them.
3. Elaborate the concept by using given PPT Slide (Application of biotechnology (Part 1) - Don't memorize. <https://www.youtube.com/watch?v=m29Y3qhCNyk>)
4. Ask the participants to note down important points or any questions while watching the video.
5. At the end of the video ask the participants to share their findings or questions if any.
6. Build the concept by using **PPT Slide/** by using given points orally.
 - Biotechnology has various applications and has made a significant impact on various sectors, including agriculture, healthcare, and environmental management. Here are some examples of the application of biotechnology in the Pakistani context.
 - ✓ **Agriculture:** Biotechnology has played a crucial role in improving the agricultural yield of Pakistan. The use of genetically modified crops has allowed farmers to produce crops that are more resistant to pests, diseases, and drought. Biotechnology has also been used to improve the quality and yield of cotton, which is a significant cash crop in Pakistan.
 - ✓ **Healthcare:** Biotechnology has revolutionized healthcare in Pakistan. It has played a critical role in the development of vaccines, diagnostic tools, and medicines. For instance, Pakistan has made significant progress in the production of insulin through biotechnology, which has made this life-saving medicine more affordable and accessible to patients.
 - ✓ **Environmental management:** Biotechnology has also contributed to environmental management in Pakistan. It has been used to develop innovative wastewater treatment systems and to reduce industrial pollution. Biotechnology has also been used to improve the quality of soil and water, which is crucial for agriculture and the overall health of the environment.

- ✓ **Food industry:** Biotechnology has also been applied in the food industry of Pakistan. It has been used to produce foods with higher nutritional values and improved taste and quality. For example, the use of biotechnology in cheese production has allowed for the development of cheese with better texture, flavor, and aroma.

Activity 3:

🕒 15 minutes

1. Divide the participants in pairs and distribute handout - "Impacts of Biotechnology".
2. Ask them to read handout in pairs.
3. Ask them to read handout and answer the questions given in handout.
4. Allocate 12 minutes for this activity.
5. Ask 2/3 volunteers to share their answers.
6. Ask the participants to self assess their work.

Activity 4:

🕒 10 minutes

1. Ask following question to know the prior knowledge of participants about fermentation.
 - What is fermentation?
 - Name some fermented foods.
 - Describe the procedure of yogurt formation. Tell the science behind it.
 - Describe the procedure of making bread. Tell the science behind it.
2. Take random responses and encourage them to participate actively.
3. Build the concept by using **PPT Slides**/Describe the following points by using board.

- Fermentation is catabolic process in which partial degradation of sugar occurs without the help of oxygen.
- Yogurt, cheese, bread, pickles are some examples of fermented foods.
- **Yogurt** is a dairy product made by fermenting milk with specific bacterial cultures. The procedure of yogurt formation involves following steps:
 - ✓ Heat treatment: The milk is heated to a specific temperature (around 85-90°C).
 - ✓ Cooling: The milk is then cooled down to a specific temperature (around 43-45°C).
 - ✓ Inoculation: A small amount of a bacterial culture is added to the cooled milk.
 - ✓ Incubation: The milk is then kept at a specific temperature (around 43-45°C) for several hours.
- The science behind yogurt formation lies in the ability of the bacterial culture to ferment lactose into lactic acid. This process lowers the pH of the milk, which causes the proteins in the milk to coagulate and form a gel-like substance. This gives yogurt its characteristic texture and tangy flavor.
- In addition to its taste and texture, yogurt also provides several health benefits. It is a rich source of probiotics, which are beneficial bacteria that help maintain a healthy balance of microorganisms in the gut. Yogurt also contains calcium, protein, and other essential nutrients, making it a nutritious food choice.
 - ✓ **Bread** is bakery product that also involves fermentation. The procedure of making bread involves following steps.
 - ✓ Mixing: Flour, water, yeast, salt, and other ingredients are mixed together in a bowl to form a dough.


- ✓ Kneading: The dough is then kneaded by hand or using a mixer.
- ✓ Proofing: The dough is then left to rest for a period of time, typically 1-2 hours.
- ✓ Shaping: The dough is then shaped into the desired shape, such as a loaf or rolls.
- ✓ Baking: The shaped dough is placed in an oven and baked at a high temperature, typically around 200-220°C, for around 30-40 minutes.
- The science behind bread-making lies in the fermentation process, which is driven by yeast. Yeast is a type of fungus that consumes sugar and produces carbon dioxide gas and alcohol as byproducts. When yeast is added to the dough, it feeds on the sugars in the flour and produces carbon dioxide gas, which causes the dough to rise.
- Baking the bread at a high temperature causes the carbon dioxide gas to expand, creating air pockets in the bread and giving it a light, airy texture.

Note:

Share the links given below / given in **PPT Slides** with participants and ask them to watch these videos at home for more learning.


- ✓ Making Yogurt: <https://www.youtube.com/watch?v=1ZSoYrHyX9c>
- ✓ The Biology of Bread! Interesting: <https://www.youtube.com/watch?v=HV9nuOpnIF0>

Activity 5:

 **12 minutes**


1. Use the handout to explain how biotechnology is used in food science to produce foods with higher nutritional values and improved taste and quality.
2. Give each individual a copy of handout - "Use of Biotechnology in Food Science".
3. Ask them to read handout # 2 individually.
4. Encourage them to explore the content by reading the handout and answering the questions given in the handout.
5. Allocate 10 minutes for this activity.
6. Ask 2/3 volunteers to share their answers.
7. Ask the participants to self assess their work.

Activity 6:

 **08 minutes**

1. Ask the questions:
 - Name some products of biotechnology.
 - How are they helpful for humans?
 - What was their effect before the use of biotechnology?
2. Take random responses and indulge them in the following activity to build the concept.
3. Divide the participants into groups of 2-3.
4. Ask participants to read "Products of Biotechnology" on pages # 40 and 41 from the Textbook General Science -8. Allocate 5 minutes for this task.
5. Ask them to note down key points by keeping the above questions in mind.
6. After completing their group work, ask a few groups randomly to share their findings.

Activity 7:

 **07 minutes**

1. Conclude the session by using the given key points.
2. Use board or **PPT Slide** for this purpose or share these points orally or by using board.

- ✓ Organism which takes in recombinant DNA is called genetic modified organism (GMO).
- ✓ Biotechnology has various applications and has made a significant impact on various sectors, including agriculture, healthcare, and environmental management.
- ✓ Biotechnology has had a significant impact on the production of food products such as bread, yogurt, and cheese.
- ✓ Biotechnology also have an effect on production of vaccine for immunization, insulin production, dyes, etc.
- ✓ Fermentation is catabolic process in which partial degradation of sugar occurs without the help of oxygen.
- ✓ Biotechnology has had a significant impact on the food industry, particularly in the development of foods with higher nutritional values and improved taste and quality.
- ✓ Bacteria which are genetically modified with human insulin gene produce human insulin which control the glucose level in blood.
- ✓ Nowadays vaccine are produced by genetic engineering are used against many diseases like Hepatitis B, foot and mouth diseases in animals, etc.

Activity 8:



08 minutes

1. Ask participants to open "QUESTIONS" given on **page # 44** of **Textbook General Science 8** to assess the participants.
2. Ask participants to solve the questions mentioned below:
 - Q1 part vi, vii, viii, ix.
 - Q2 parts i, ii, iii
 - Q3 part ii
3. Allocate 8 minutes for this task.
4. After the participants complete their task, share the correct answers with them.
5. Ask the participants to self asses their work.



Handout No. 1

Impacts of Biotechnology

Biotechnology has had a significant impact on the production of food products such as bread, yogurt, and cheese. Biotechnology also have an effect on production of vaccine for immunization, insulin production, dyes, etc. These effects have both positive and negative implications for the people and environment of Pakistan over time.

Positive effects of biotechnology on bread making, yogurt, and cheese, healthcare and industrial products in Pakistan include:

Improved quality of food:

Biotechnology has been used to develop strains of yeast and bacteria that can improve the quality of bread, yogurt, and cheese products in Pakistan. For example, the use of genetically modified yeast can help produce bread with better texture and longer shelf life.

Increased production of food:

Biotechnology has also helped increase the production of bread, yogurt, and cheese in Pakistan. For example, the use of bacterial cultures in yogurt production has helped increase the yield and reduce production time.

Reduced wastage of food:

Biotechnology has helped reduce wastage of food products in Pakistan. For example, the use of bacterial cultures in cheese production can help reduce the amount of milk required to produce cheese, thereby reducing wastage.

Improved Healthcare:

Biotechnology has helped in the development of vaccines for immunization and the production of insulin for diabetes patients in Pakistan. Biotechnology has also been used in the production of diagnostic kits and drugs that have improved healthcare in Pakistan.

Industrial Applications:

Biotechnology has also been used in the production of dyes, enzymes, and other chemicals in Pakistan. This has led to the development of new industries in the country and provided employment opportunities.

Negative effects of biotechnology include:

Potential health risks:

The use of genetically modified yeast and bacteria in food production may raise concerns about potential health risks to consumers in Pakistan.

Environmental risks:

The use of genetically modified yeast and bacteria may pose environmental risks if they escape into the environment and interact with native microorganisms.

Questions:

1. What are impacts of biotechnology on food products?
2. How can we reduce wastage of food by using biotechnology? Give example.
3. What is the role of biotechnology in healthcare and industries?



Handout No. 2

Use of Biotechnology in Food Science

Biotechnology has had a significant impact on the food industry, particularly in the development of foods with higher nutritional values and improved taste and quality. Biotechnology has enabled food scientists to identify and manipulate specific genes responsible for desirable traits in food crops and animals, resulting in the production of new and improved food products. Here are some examples of how biotechnology is used in food science to produce foods with higher nutritional values and improved taste and quality.

Genetic Modification:

Biotechnology has allowed food scientists to modify the genetic makeup of crops and animals to produce desirable traits. For example, scientists have developed genetically modified crops that are resistant to pests and diseases, have increased yields, and are more nutrient-dense. This has led to the development of new and improved food products that have higher nutritional values and improved taste and quality.

Fermentation:

Fermentation is a biotechnology process that is used in the production of many foods, such as bread, cheese, and yogurt. During fermentation, microorganisms such as bacteria or yeast are used to break down sugars and other compounds in food, resulting in a product that has a unique taste, texture, and nutritional profile. Fermentation can also increase the bioavailability of nutrients in food, making them more easily absorbed by the body.

Enzyme Technology:

Enzymes are natural proteins that catalyze biochemical reactions in food. Biotechnology has enabled food scientists to produce enzymes in large quantities, which can be used to improve the taste, texture, and nutritional quality of food. For example, enzymes can be used to break down complex carbohydrates in food, making them easier to digest and increasing their nutritional value.

Nutraceuticals:

Nutraceuticals are foods or food components that have health benefits beyond basic nutrition. Biotechnology has enabled food scientists to identify and isolate specific compounds in food that have health benefits, such as antioxidants, phytochemicals, and probiotics. These compounds can be used to develop new and improved food products that have higher nutritional values and improved taste and quality.

In conclusion, biotechnology has played a significant role in the development of new and improved food products with higher nutritional values and improved taste and quality. By using biotechnology in food science, scientists are able to identify and manipulate specific genes, use fermentation processes, enzyme technology, and develop nutraceuticals to improve the nutritional value and taste of foods. The use of biotechnology in food science is likely to continue

to grow in importance as consumers increasingly demand healthier, more nutritious, and better-tasting food products.

Tick the correct answer:

1. Which of the following is NOT a way biotechnology is used in food science?
 - a. Producing foods with higher nutritional values
 - b. Improving taste and quality of foods
 - c. Developing crops that are resistant to pests and diseases
 - d. Increasing the amount of saturated fats in foods
2. What is one-way, biotechnology can improve the taste and quality of foods?
 - a. By increasing the shelf life of the food
 - b. By adding artificial flavors and colors to the food
 - c. By enhancing the natural flavors and aromas of the food
 - d. By reducing the amount of sugar in the food
3. How does biotechnology improve the nutritional value of foods?
 - a. By adding vitamins and minerals to the food
 - b. By reducing the amount of unhealthy fats in the food
 - c. By increasing the amount of protein in the food
 - d. All of the above



ANSWER KEY
Handout 1 Questions Solution

1. What are impacts of biotechnology on food products?

Ans. Biotechnology has had a significant impact on the food industry, particularly in the development of foods with higher nutritional values and improved taste and quality.

2. How can we reduce wastage of food by using biotechnology? Give example.

Ans. We can reduce the wastage of food by reducing the amount of material required to make a product. For example, the use of bacterial cultures in cheese production can help reduce the amount of milk required to produce cheese, thereby reducing wastage.

3. What is the role of biotechnology in healthcare and industries?

Ans. Biotechnology has helped in the development of vaccines for immunization, production of kits and drugs. It has also been used in the production of dyes, enzymes, and other chemicals in industries.

Handout 2 Questions Solution

1 – d

2 – c

3 - a

Assessment Question Solution

Q1. Encircle the correct option:

vi - a

vii - d

viii- d

ix - d

Q2 Write short answers.

- i. Biotechnology is the application of living organisms or their components to create useful products and processes for various industries.
- ii. Insulin and Vaccine
- iii. **Agriculture:** The use of biotechnology has allowed farmers to produce crops that are more resistant to pests, diseases, and drought.
Health: Biotechnology has played a critical role in the development of vaccines, diagnostic tools, and medicines.
Food Production: Biotechnology has been used to produce foods with higher nutritional values and improved taste and quality.

Q3 Constructed response questions.

- ii. Bread, cheese, yogurt, insulin by diabetic patients, vaccines, bioplastics, lotions, etc.

**STUDENT LEARNING OUTCOMES**

By the end of the session, participants will be able to:

1. recognize cells as the basic units of life that are organized into tissues, organs, organ systems and organisms;
2. relate the structures of some common cells (nerve, muscle, epithelium and blood cells) to their functions.

MATERIALS

- Writing board
- Marker / Chalk
- Textbook General Science 6
- Lego blocks/empty match boxes, glue
- A4 sheets, pencils and colour pencils
- A water pipe and a coil of wire.
- A cup and a plate
- PPT slides or Poster of an animal cell.
- Chart paper
- Multimedia
- Worksheets

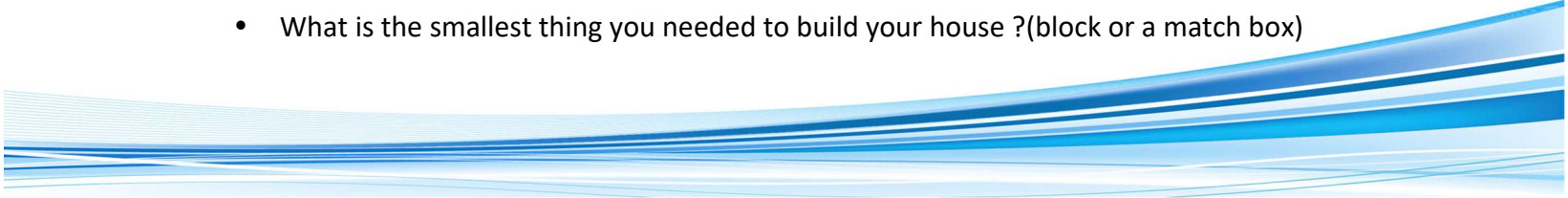
Opening

05 minutes

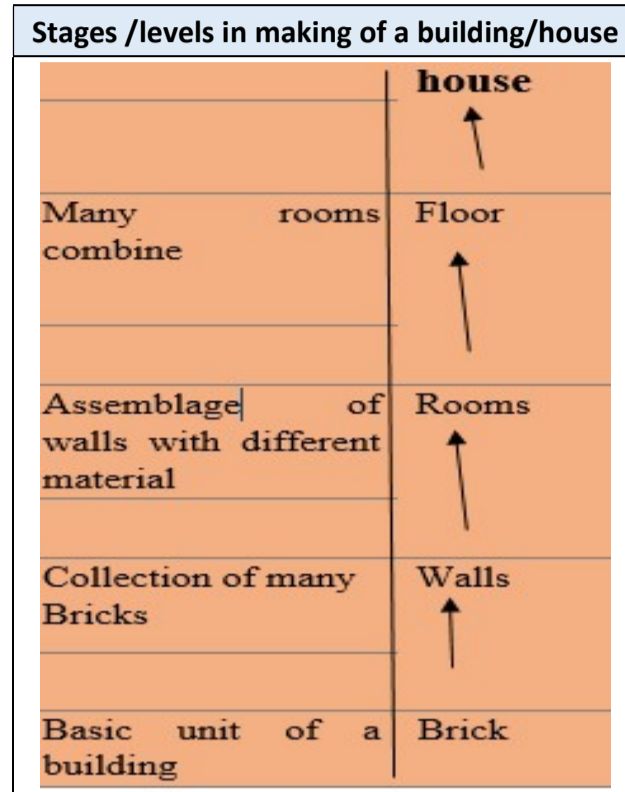
1. Ask the participants about;
 - Their expectations about the session.
 - What they know about cells, their types and functions?
 - What do they expect to learn?
2. While listening their expectations show them the related PPTslide or write SLOs on the board.
3. Readout all SLOs of the session and switch to the main session

Activity 1:

15 minutes


1. Divide students into different groups(number of groups depends upon number of participants)
 2. Provide them Lego blocks or match boxes and glue,
 3. Ask to build a house with these blocks.
 4. Give 5 minutes to complete their houses.
 5. Ask them to put them aside.
 6. After they are settled, dissect the steps, involved in the making of house, by asking following questions, to which they will answer in the light of their house making experience.
 - What is the smallest thing you needed to build your house?(block or a match box)
- 

- What is the first structure that you made with blocks? (walls)
 - Complete the sequence till the building by asking them what they did next?
7. Relate this activity with actual buildings and ask them what is the building block of a real house? (a brick) .
 8. Provide all participants an A4 paper and ask to write different steps involved in the making of house on their sheets.
 9. Give them 2 minutes for that.
 10. As they are writing, take a round and observe what they are writing.
 11. After 2 minutes ask them to tell all stages in building a house with sequence and write it on board.



Conclude the segment by telling them that every big structure is made up of different small units. These are called building blocks.

Activity 2:

 15 minutes

1. Now ask them that:
 - Can we apply this rule on living organisms? (all structures are made up by joining small building blocks)
 - What are the bodies of living organisms made up of? (cells)
 - What is our body made up of? (cells)
2. Now ask them;
 - Draw a table on their paper sheet with 3 columns.
 - Write in first column any five functions that they have performed since morning?
3. They may write different things like, walking, eating, breathing, writing, thinking, speaking etc.
4. As they write, take responses from random participants about what they have written.

5. Now ask them to write the names of parts of their body that are involved into these functions,
6. Finally ask them to write the name of system under which they perform that function.

Sample of Participants working		
Function	Organs	System
Eating	Mouth, stomach, intestine	Digestive
Breathing	Nose, lungs	Respiratory system
Thinking	Brain	Nervous system

7. Now ask any participant to tell the name of first system he has written in his list.eg. Nervous system
8. Ask the whole class that what are different organs found in that system.
9. Now ask what are these organs made up of?
10. Take few responses and ask
 - What do you know about the building block of a living organisms? (previous knowledge)
11. Repeat with them the definition of a cell.

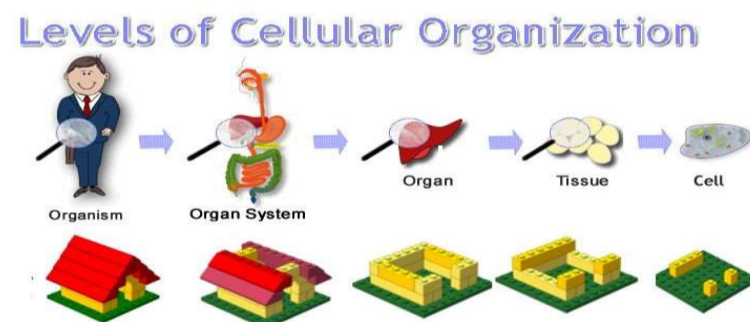
- Cells are the building blocks of all living organisms.
- Cells are structural and functional unit of living organisms.

12. Now ask them that how these cells join to make an organism.
13. What is the first structure made by cells called?
14. Take few responses and tell it is called, "A Tissue", which in turn join to make different organs.
15. Now write all levels of cellular organization on the board in wrong sequence.

Board Sample

Organ, cell, system, organism, tissue.

16. Ask them all to get back to the pages where they wrote stages of building a house, draw another column and write stages of cellular organization in its comparison.
17. Take round, observe what they are doing.
18. Ask any volunteer to come and fill the same on board,
19. Rest all will tell whether he is right or wrong.
20. Now show them the slide, poster or draw on board to tell different stages in cellular organization along with a comparison with stages in building a house.



21. Now show them the related **PPT slide** or draw a table on the board and compare the levels

of organization in living organisms making a house/building.

Board sample			
Comparison between organization of a house and an organism			
Many rooms combine	house ↑	Organism ↑	Association of different organs system
Assemblage of walls with different material	Floor ↑	Organ system ↑	Coordination of organs to complete a task
Assemblage of walls with different material	Rooms ↑	Organs ↑	Organization of different tissues
Collection of many Bricks	Walls ↑	Tissues ↑	Organization of Similar cells
Basic unit of a building	Bricks	Cell	Basic unit of life

22. Now distribute worksheet #1 to the participants (in pairs).

23. Ask them to discuss and solve it.

24. After solving, ask them to open the text book General science 6 at page #1 and check vocabulary words to match their answers.

Activity 3:



20 minutes







1. Call 2 participants.
2. Give water pipe to one and ask him to plug it into the socket to charge the mobile.
3. Give coil to the second and ask him to fill the water bottle from the tap with the help of that coil
4. Pause a little and listen to the response of different participants.
(All might say that it is not possible)
5. Now ask them why?
6. Now give a plate to a participant and ask him to bring Tea in it and
7. Give a cup to another and ask him to bring for you a rice in it?
8. Again let them react on these commands, pause a little and ask
9. Why the function of a thing is associated with its shape and material.
10. Take responses and conclude that:

Material and shapes of different things are very important for the function they perform.

Give examples of

- Copper wires or electric circuits
- Pipes for water supply
- Plates for food and
- Cups for tea

11. Now ask them
 - What do you think about living organisms/
 - How they perform different functions?
12. Ask them that are all cells of the same kind.
 - Can cells of brain digest the food if used in stomach and vice versa?
There answer will be no.
13. Now ask them names of different kinds of cells?
14. Ask that what they know about shape structure and function of these cells?

		
		
Nerve cells	Bone cells	White blood cells

15. Show them slide/Flash cards of different kinds of cells and ask to guess their names.(don't show them names)
16. After they guess the name revise all names of different kinds of cells with their pictures.
17. Now provide one A4 paper to each participant. Ask them to make a table on it.
18. Make a sample on Board.

Name of cell	Shape	Function


19. Ask them to write names of cells in different column, see the picture, write its shape and write what they know about their function.
20. Give them 6-8 minutes.
21. Now ask them to exchange their sheets with one another and comment each other.
22. Show the related **PPT slide** or write on the board and conclude the segment with active participation of all class.

<ul style="list-style-type: none"> • There are many different kinds of cells in the human body. • Some important types of cells are: 		
Name of cell	Shape	Function



Muscle cells	Long and cylindrical	Their cylindrical shape helps them to contract and relax for movement.
Nerve cell or Neuron	Long and branched	Send messages from one part of the body to another.
Red blood cells	Disc shaped and red colour	Provide oxygen to body and take out carbon dioxide.
White blood cells	Irregular in shape	Help body to fight infections and other diseases.
Epithelial cells	Closely packed like Tiles	Make layers of skin.
Bone cells	Flat, short and irregular in shape	Give shape and provide support.

Activity 4:

 15 minutes

1. Divide whole class into 6 groups

Round 1:

1. Assign each group one Organ system each
2. Provide each group half of a chart paper.
3. Ask them to make a presentation of cellular organization with the help of drawing and coloring.
4. Tell them that presentation will be judged for:
 - Information
 - Presentation
 - Creativity and
 - Time management
5. After the instructions, give them 10minutes to complete their presentation.
6. Tell them to keep the presentation on their tables.

Round 2

1. Give second set of instructions.
2. Now all groups will go to the table of other groups, to check, comment, and give suggestions in writing at the side of the poster.
3. Tell them also to nominate the best chart.
4. Tell them that they will move in a clockwise direction.
5. On each table they will be given 1 minute.
6. Tell them that your clap will be the signal to move to the next table.
7. Monitor them vigilantly, that all the participants are actively involved.

- At the end, appreciate all participants for their effort and have a clap for all.

Sample of Presentation



CONCLUSION / SUM UP/ WRAP UP:

🕒 10 Minutes

- Wrap up the session by recalling all the points with involvement of participants.
- Show them the related PPT slide/Poster or verbally discuss the key points.



Key Points

- ✓ Cell is the basic structural and functional unit of life.
 - There are many different kinds of cells.
 - Cells combine to form a tissue.
 - Related tissues combine to make an organ.
 - Different organs coordinate to complete the task of a system.
 - All systems combine to make an organism.
 - Cells have different shapes and sizes, which help them to perform their function.
 - Nerve cells are long and branched.
 - Muscle cells are long and cylindrical.
 - Red blood cells are disc shaped, they contain a red pigment, called Haemoglobin.
- ✓ Epithelial cells are tile shaped and closely packed.

1. Give them worksheets "Identify and Write the name of cells in front of the diagram" "Short Answers of the Questions" to solve (pair work).
2. One member from each pair will solve worksheet "Identify and Write the Name of Cells in front of the diagram" and the second member will solve worksheet "Short Answers of the Questions".
3. After solving they will exchange the worksheets for checking.
4. At the end discuss openly with whole class to cross check their answers.
5. Spare few minutes for the post session discussion, discuss if they have any other question/problem related to the topic.
6. End the session with a greeting note.

Answer key to worksheet "Short Answers of the Questions"

Q1. Transport oxygen to the whole body. Take away carbon dioxide. Transport nutrient.

Q2. Hemoglobin.

Q3. They are tile shaped and closely packed. They give protection to the body organs.

Q4. Cell, Tissue, Organ, Organ system and organism.

Worksheet No. 1

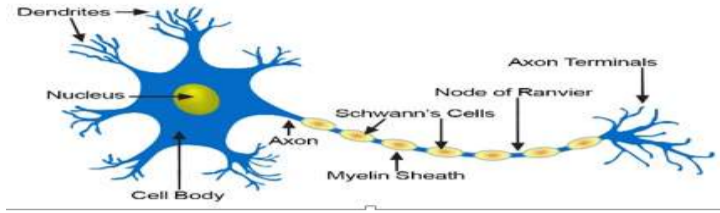


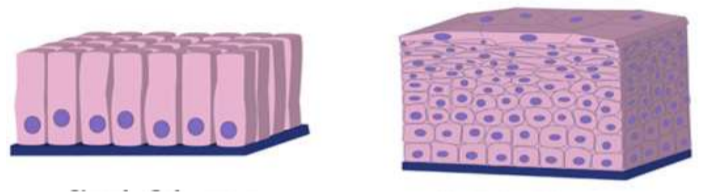

Match the column A to the right description in column B

A	B
Cell	Basic unit of a building
Organ	Organization of similar cells
A brick	Grouping of related tissues
Organisms	Coordination of different organs to complete a task
Tissues	Basic unit of life
Organ system	Association of different organ systems



Worksheet No. 2

Identify and write the name of cell in front of the diagram.

Diagram	Name
	
	
	
	
	

Worksheet No. 3

Short Answers of the following questions.

Q.1 Write 3 functions of blood in a human body?

Answer:

1. _____
2. _____
3. _____

Q.2 Name the red colored pigment present in red blood cells.

Answer:

Q.3 What is the shape of epithelial cells? Why they have this shape?

Answer:

Q.4 Name different levels of cellular organization in sequence?

1. _____
2. _____
3. _____
4. _____
5. _____

Additional resource: Watch the video to get a more clear concept

<https://youtu.be/8KUJHMniOIM>



**STUDENT LEARNING OUTCOMES**

By the end of the session, participants will be able to:

1. identify the constituents of balanced diet for human as including protein, carbohydrates, fats and oils, water, minerals (limited to calcium and iron) and vitamins (limited to A, C & D) and describe the function of these nutrients
2. identify the essentials nutrients, their chemical composition and food sources.
3. identify and describe essential nutrients' deficiency disorders.
4. recognize that a healthy diet contains a balance of food stuffs.
5. correlate diet and fitness.

MATERIALS

- Writing board
- Board marker / Chalk
- Textbook General Science-6
- Video / Multimedia/ speakers
- Flipcharts/ permanent markers
- Worksheet

Opening

05 minutes

1. Ask the participants:
 - What are your expectations about the session?
 - What challenges do you face during teaching the topic "Balanced Diet"?
2. Share the learning outcomes of the session with the participants through **PPT slide** / verbally or read from the textbook.

Activity 1:

15 minutes

1. Warm up questions:
 - What is the first thing that comes to your mind when you think of the word "food"?
 - What is your favourite food and why?
 - What will happen to the body if you do not eat food for many days?
 - What is the importance of food in life?
 - What are the main sources of food?
2. After getting responses from a few participants, discuss **PPT slide**
 - ✓ Food provides us energy and nutrients, needed for vital processes such as growth, repair, reproduction and protection from diseases.
 - ✓ Our body is like a machine. It has to perform many tasks internal (breathing, digestion etc.) and external (study, play, run etc.) for which it needs a lot of energy and this energy comes from the food we eat.

✓ Animals and plants are the main sources of food.

3. Recall the food groups studied in the previous classes and name the food items included in each food group. (Discussion)
 - Write the names of food groups on the board after taking responses from participants
4. Proteins, Carbohydrates, Fats, Vitamins and Minerals
5. Ask examples of food such as potatoes, milk etc. and inquire to help to place it under the appropriate heading.

The five food groups are; Proteins, Carbohydrates, Fats, Vitamins and Minerals

6. Ask participants:
 - What did you take for breakfast, lunch and dinner yesterday?
 - What will happen if you take the same type of food every day?
7. After getting responses from a few participants, discuss **PPT slides**.

- ✓ All food items contain very useful material called nutrients which perform very important functions in the body.
- ✓ Our body cannot make these nutrients themselves so we need to obtain them through food.
- ✓ On the basis of the nutrients found food is divided into categories.
- ✓ The food containing nutrients that help in building and repair of the body are called **proteins**.
- ✓ Quick energy giving foods are **carbohydrates**.
- ✓ **Fats** are the richest source of energy and protect the body from the effect of temperature.
- ✓ **Vitamins** protect the body help in the formation of body tissues from diseases and keep our eyes, bones, teeth and gums healthy.
- ✓ **Minerals** are needed for the formation of body tissues like bones, teeth and blood cells.
- ✓ So we need to include food from different food groups as proteins, carbohydrates, fats,
- ✓ Vitamins and minerals in our diet to make it a healthy and balanced diet.

8. Think pair and share

Step 1

Think individually and write what you mean by the terms diet and balanced diet

Step 2


Discuss the responses with the partner, refine and present the findings to the class

9. Whole class discussions:
 - What is the difference between a diet and a balanced diet?
 - What are the essential components of a balanced diet?
 - What will happen if we do not take a balanced diet?
10. After getting responses from the participants, discuss PPT slide



- ✓ A diet is all that we eat in a day.
- ✓ A balanced diet is a diet that contains an adequate quantity of the nutrients (Fats, carbohydrates, proteins, fats, vitamins and minerals) required in a day.
- ✓ A balanced diet includes five main nutrients. On the basis of these nutrients, food is classified as: carbohydrates, proteins, fats, vitamins and minerals.
- ✓ An unbalanced diet leads to nutritional disorders as bleeding of gums etc.

Activity 2:

 15 minutes

1. Divide the participants into five groups
2. Assign one nutrient (carbohydrates, protein, fats, vitamins and minerals) to each group
3. From their lunch boxes ask them to take out food belonging to the group assigned
4. Read the information about the food groups assigned from the Textbook General Science-6 page nos. 33 – 36
5. Tell that each group will list their findings under the following headings.

Nutrient	Source	Functions	Chemical compositions
----------	--------	-----------	-----------------------

Note:

Give participants some newspapers or magazines that contain pictures of foods from the different food groups. **They can also draw food items.** Ask them to cut out / draw pictures of foods from their assigned food group and stick them on the sheets of card OR on their flipcharts


6. Ask each group in turn to share what they learned about their allocated food group. They should talk about the various food items that are part of that group, their nutrients, source, functions and chemical composition. Encourage the other group members to ask questions
7. Ask each group to present their findings on a chart paper for class presentation
8. Provide feedback to each group
9. After the presentations, conclude the activity through discussion on **PPT slides**

- Carbohydrates provide energy. They work as fuel to facilitate life processes. Carbohydrates are made up of carbon, hydrogen and oxygen, sources of carbohydrates are both animals and plants.
- Proteins provide material for growth, repair and reproduction so they are called the building blocks of our body. Proteins are made up of carbon, nitrogen, hydrogen and oxygen. The sources are both animals and plants.
- Fats are stored under the skin and protect the body from the effects of temperature changes. They give safety cover to organs such as heart, brain, kidney and liver. They keep our body warm and are called secondary source of energy. They are made up of carbon, hydrogen and oxygen. The sources of fats are both plants and animals
- Vitamins protect from diseases and keep our eyes, bones, teeth and gums healthy. Sources of vitamins are both animals and plants. Vitamins are organic molecules (or a set of closely related molecules called vitamers) that are essential to an organism in small quantities for proper metabolic function. Essential nutrients cannot be synthesized in the organism in sufficient quantities for

survival, and therefore must be obtained through the diet. Vitamins are soluble either in water or in fats/oils.

- Minerals are needed in the formation of body tissues such as bones, teeth and blood cells. The sources are animals and plants. Calcium, phosphorus, potassium, sodium, chloride, magnesium, iron, zinc, iodine, chromium, copper, fluoride, manganese are the examples of minerals needed by humans
- Fiber is a type of carbohydrate which helps the food move easily through our intestines
- Water is an essential component which helps in the movement of food in the alimentary canal.

Activity 3:

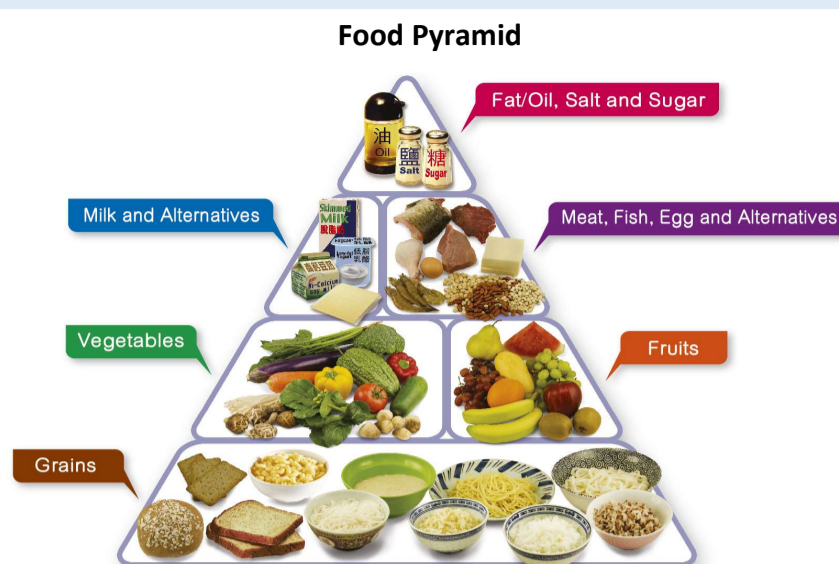
 15 minutes

Deficiency of nutrients: <https://www.youtube.com/watch?v=z0LAOQyk5hU>

1. Show participants a video on nutritional deficiency disorder
2. Pause the video after each nutrient deficiency disorder discussed and ask related questions
3. On completion of video recap the information
4. Ask the following questions.
 - If Ali eats fast food only what sort of diet is he taking?
 - Omer studies in class 6. His parents repeatedly ask him to study for extended hours to get good grades. Omer avoids studying for late hours as he finds a blurred vision after some time. Guess the nutritional deficiency: (Vitamin A)
 - Amina is 11 years old but is not growing according to her age. She looks as an 8 year old
 - Guess the nutritional deficiency: (Proteins)
 - Saadia hates to eat spinach, greens, beetroot and apples. She is growing pale day by day.
 - Guess the nutritional deficiency: (Iron)
 - Guess if there is no intake of iodine what will happen?
 - What causes goiter?
5. Discuss effects of unbalanced diet from **PPT Slide**

- ✓ Material ad shapes of different things are very important for the function they perform.
- ✓ Nutrient deficiency means deficiency of one or two of the nutrients carbohydrates, proteins, fats, vitamins and minerals in the diet.
- ✓ Nutritional deficiency can have different causes but basic cause of nutritional deficiency includes inadequate intake, inadequate absorption and increased requirement of a nutrient which is not met due to an unbalanced diet.
- ✓ Nutrient deficiencies may cause several serious diseases, like goiter, mental retardation, acute respiratory infections, decreased cognitive function, cancer, vision loss, rickets, pellagra, beriberi, and diarrhea.






1. Show the food pyramid through a slide or textbook or poster or draw it on the board.
2. Ask questions
 - What does this diagram represent?
 - Assist participants to read the diagram?
 - What food items are placed at the base of the pyramid?
 - Why does it gradually narrow?
 - What food is placed at the top and why?
3. After taking responses explain food pyramid on page 38 of the book.
4. Conclude the activity using the given points on **PPT slides**

- ✓ Food pyramid is a visual representation of the proportions of different foods you should eat every day in order to maintain a balanced diet.
- ✓ Eat Most – Grains,
- ✓ Eat More - Vegetables and fruits
- ✓ Eat Moderately - Meat, fish, egg and alternatives (including dry beans) and milk and alternatives
- ✓ Eat Less - Fat/ oil, salt and sugar
- ✓ Drink adequate amount of fluid (including water, tea, clear soup, etc.) every day
- ✓ If each meal is planned in proportion with the healthy eating pyramid, then you are much more likely to achieve your daily requirements for vitamins, minerals, carbohydrates, proteins and essential fats.

5. Ask the participants to read activity 3.3 on **page 38 of Textbook grade 6**.
6. Participants will work in pairs and record what they ate for lunch /breakfast and dinner yesterday.
7. They will examine the record and conclude whether their diet is balanced or not?
8. Ask the participants to make a diet plan for adults using the food pyramid.
9. Sum up the activity by asking them if proportion of food is added according to the health pyramid.


Activity 5: **10 minutes**

1. Ask questions
 - Whom do you consider a fit person among your friends?
 - How did you make the judgment?
 - What sort of diet does your friend take?
2. After the responses from the participants, show PPT Slide and discuss
 - ✓ A combination of diet and exercise is suggested to achieve optimal health and fitness.
 - ✓ Healthy diet plus regular exercise maintains physical and mental health.
 - ✓ When you exercise and eat right, your body functions well because it receives the nutrients it needs for physical activity to improve strength, fight against stress, body composition, and cardiovascular health.
 - ✓ So, we can correlate diet and fitness

CONCLUSION / SUM UP/ WRAP UP:**08 minutes**

1. **PPT Slides** or prepare a chart with learning outcomes and display on the board.
2. Conclude the session by using following key points PPT Slides.
 - ✓ Plants and animals are the main sources of food.
 - ✓ Food provides us energy and matters essential for growth, repair and reproduction.
 - ✓ Carbohydrates, proteins, fats, vitamins and minerals are main groups of food.
 - ✓ A balanced diet includes five main nutrients. On the basis of these nutrients, food is classified as: fats, carbohydrates, proteins, fats, vitamins and minerals.
 - ✓ A diet is all that we eat in a day.
 - ✓ Carbohydrates provide energy. They work as fuel to facilitate life processes
 - ✓ Proteins provide material for growth, repair and reproduction so they are called the building blocks of our body
 - ✓ Fats are stored under the skin and protect the body from the effects of temperature changes. They give safety cover to organs such as heart, brain, kidney and liver. They keep our body warm and are called secondary source of energy.
 - ✓ Vitamins and minerals are required in small amounts but they are essential for proper growth and maintenance of good health.
 - ✓ Fibre is a type of carbohydrate which helps the food move easily through our intestines
 - ✓ Water is an essential component which helps in the movement of food in the alimentary canal
 - ✓ Food pyramid helps to select proper diet.
 - ✓ A combination of diet and exercise is suggested to achieve optimal health and fitness

ASSESSMENT **07 MINUTES**

1. Use the given assessment sheet to assess the participants
 2. Ask the participants to solve the given assessment sheet.
 3. In the end share the correct answers with the group
 4. Ask the participants to self-assess their work.
- 

Worksheet No. 1

Balanced Diet

Q.1. Encircle the correct option.

1. **Balanced diet for an infant is:**

a. fruit b. milk c. vegetable d. egg

2. An immediate source of energy in our body is:

a. mango b. chicken c. mushroom d. meat

3. Food rich in carbohydrates is:

a. corn oil b. beef c. egg d. starch

4. Which vitamin makes the bones strong?

a. Vitamin A b. Vitamin B c. Vitamin C d. Vitamin D

Q 2. Answer the following questions.

1. What is a balanced diet?
2. Name major a food groups.
3. What are the sources and functions of minerals
4. What is food pyramid?

Q. 3. A diet containing some nutrients too much and some too little, is called an unbalanced diet

1. What can happen if someone takes an unbalanced diet for a long time?
2. What will happen if there is a deficiency of iron in the food?
3. What will happen if there is a deficiency of vitamin c?

Balanced diet video links

Food Groups and Nutrition - <https://www.youtube.com/watch?v=Z51bWG17m-Q>

Essential Nutrients - <https://www.youtube.com/watch?v=Urr-MKks8zc>

Balanced Diet - <https://www.youtube.com/watch?v=YimuldEzSNY>

Video deficiency of food

<https://www.takshillearning.com/balanced-diet-and-its-components/>

Tooth decay due to excessive sugar intake

<https://www.youtube.com/watch?v=UewfeRZlwMI>

Food components: <https://www.youtube.com/watch?v=Z51bWG17m-Q>

Balanced diet: <https://www.youtube.com/watch?v=YimuldEzSNY>

Deficiency of nutrients: <https://www.takshillearning.com/balanced-diet-and-its-components/>

Deficiency of nutrients: <https://www.youtube.com/watch?v=z0LAOQyk5hU>

[Balanced diet, food groups and nutrition](#)

[The Food Pyramid for Kids | Balanced Diet | Food Groups And Nutrition | Healthy Plate for Kids - YouTube](#)

**STUDENT LEARNING OUTCOMES**

By the end of the session, participants will be able to:

1. make bioplastic from milk and vinegar as an application of biotechnology;
2. make toothpaste, soap and detergent as an application of acids and bases in daily life;
3. assemble a concave mirror type solar cooker to convert solar energy into heat;
4. assemble and operate a simple wind turbine to produce electricity;
5. demonstrate the working of UPS and use it to operate a fan or energy saver bulb.

MATERIALS

- Writing board
- Marker / Chalk
- Video
- Multimedia and PPT slides
- Chart paper and writing markers
- Textbook General Science-6

Opening


05 minutes

1. Ask the participants about their expectations from this session.
2. Share session learning outcomes by showing the related PPT Slides to them.


Activity 1:

10 minutes


1. Inquire from the participants what they know about the land pollution.
2. After taking responses, tell them that plastic waste has become a big issue of land pollution.
3. Now ask that, what its reason is.
4. After taking responses, tell the participants that the use of plastic is causing land pollution, because plastic is non-biodegradable substance.
5. Now ask the participants that is there any substitute of plastic.
6. After getting their responses, tell them that bioplastic is a substitute of plastic.
7. Bioplastic is a biodegradable material.
8. Ask the participants that do you know about biodegradable and non-biodegradable materials.
9. After getting their responses, show them the following video;
<https://youtu.be/YeVLBkypPRU>
10. Conclude the discussion by using the related PPT Slide.

- ✓ The difference between biodegradable and non-biodegradable materials is their ability to be broken down or decomposed naturally.
 - ✓ Biodegradable materials are those that can be broken down into natural substances by bacteria, fungi, and other living organisms.
- 

- ✓ Biodegradable materials can be broken down into simpler, natural materials, while non-biodegradable materials cannot be broken down.
- ✓ As a result, biodegradable materials are often be considered more environmentally friendly because they can be decomposed naturally and do not cause land pollution.

Activity 2: **15 minutes**

1. Ask the participants;
 - Have you ever used bioplastic?
 - Ask the reason for their response.
2. Showing the related PowerPoint to them, tell that:
 - Bioplastic is a biodegradable material. It is environmental friendly and do not cause land pollution.
 - Tell the participants that bioplastic is the need of time and its usage is increasing day by day.
 - Tell them that we can make bioplastic at home.
3. Now show the following video;
https://youtu.be/f-PT-PxA_Sk
4. After watching video ask any volunteer to tell the step-by-step procedure of making bioplastic at home in front of the participants.
5. Now divide the participants in groups and ask them to open pages # 137 -140 of the book.
6. Assign one task from the given two procedures of making bioplastic to each group.
7. Give five minutes to read the procedure and prepare a flowchart of assigned task of making bioplastic.
8. Invite one volunteer from two or three group to present his / her group flowchart.
9. Appreciate the participants for their presentations.

Activity 3: **10 minutes**

1. Ask the participants;
 - What will happen if you do not clean your teeth regularly?
 - What is being used to clean the teeth by most of the people?
 - Can we make this toothpaste at home?
2. After getting their responses, tell them that we can make toothpaste at home.
3. Show the following video;
<https://youtu.be/uAO9ce9OPhQ>
4. Now ask the participants to open page # 141 of the textbook General Science 6 PCTB and read the procedure of making toothpaste in pairs.
5. Call 2-3 participants in front of the class and ask them to share the steps of making toothpaste at home.

Activity 4:

🕒 12 minutes

1. Write six paper slips of the following and put on a table in mixed form.

Making Soap**Making detergents****3 paper slips****3 paper slips**

2. Divide the participants in six groups and ask each group to pick a chit from the table.
3. Now ask them to open page # 142 of textbook General Science 6 PCTB and read the steps required to make soap or detergent working in groups.
4. Instruct them to note down the steps on a chart paper in a sequence.
5. Give them three minutes to read and three minutes to prepare a chart.
6. Take a round in the class and involve all the participants in the activity and ensure their active participation.
7. Call out any two groups to present their working in front of the class.
8. Encourage the participants for their active participation.


Activity 5:

🕒 12 minutes

3. Ask the participants
 - What is a concave mirror?
 - What is its function?
 - Have you ever seen?
4. After getting the responses, by using the related PowerPoint slide and tell them that:
 - ✓ A concave mirror is a reflective surface that curves inward like a bowl and it is also known as a converging mirror because it can converge or focus light rays.
 - ✓ When light rays from an illuminated object are incident on a concave mirror, the rays reflect and converge at a single point known as the focus.
 - ✓ Concave mirrors are used in a variety of applications, such as telescopes, microscopes, and reflecting headlights.
5. Now ask the participants, do you have any experience of cooking food with the help of the sunlight.
6. Encourage them to share their experiences.
7. Tell the participants that we can use the sunlight to cook our food.
8. Now start the discussion by asking following questions;
 - What is a solar cooker?
 - How it works?
 - Do you have any experience of its use?
9. After getting their responses, show the following video;
<https://youtu.be/n5UYZ0QaXwE>
10. At the end of video, ask the participants how solar cooker works.
11. Encourage them to share their responses.
12. Conclude the activity by using the related PowerPoint slide:
 - ✓ If a concave mirror is directed towards the Sun, the Sun rays coming parallel to principal axis converge at a point after reflection from the mirror.



- ✓ The combined effect of all the rays increases temperature at this point.
- ✓ If we place any metallic object at this point, it will heat up.

Activity 6: **10 minutes**

1. Divide the participants in pairs and ask them to open page # 145 & 146 of the textbook grade-8.
2. Assign one of the following tasks to each pair;
 - Assemble a simple wind turbine to produce electricity.
 - Demonstrate the working of UPS and use it to operate a fan or energy saver.
3. Instruct them to read the given procedure in the textbook General Science 8.
4. Give them 3 minutes to read.
5. Now ask the participants;
 - How can we produce electricity by wind?
 - Which energy is converted into electricity by a wind turbine?
 - What does UPS stand for?
 - How does a UPS work?

CONCLUSION / SUM UP/ WRAP UP: **10 Minutes**

Involve the participants to recall and conclude the session by using the related PowerPoint slide:

1. Bioplastic is a substitute for plastic and it is a biodegradable material. Bioplastic is an environmentally friendly material and does not cause land pollution.
2. Technology has a tremendous role of making our daily life easier. We can make bioplastic, toothpaste, detergents, soap, solar cooker, UPS etc. at home as homemade products.

ASSESSMENT **08 MINUTES**

1. Instruct the participants to open page # 147 of the textbook General Science 8 and solve question 2 in pairs.
2. Give 3 minutes for this task.
3. Move around in the class and observe their work and guide them where necessary.
4. Instruct them to stop writing and check their answers.
5. Read the statement of question one by one and ask the participants to share their answers.
6. Tell the correct answer and see how many participants have correct answers.

Answers

1. Uninterrupted power supply.
2. Bioplastic is environmentally friendly.
3. Glycerol is added to increase the flexibility.
4. Wind energy.
5. A concave mirror is a type of mirror with a surface that curves inward.
6. Soaps are made from natural materials such as fats and oils, while detergents are made from synthetic chemicals.
7. Bioplastic does not cause land pollution.

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